



**Data Evaluation Summary Report for the  
Baseline Ecological Risk Assessment  
Gulfco Marine Maintenance Superfund Site  
Freeport, Brazoria County, Texas  
EPA Identification No. TXD055144539**

**Non-Time Critical Removal Support**

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**LIST OF ACRONYMS AND ABBREVIATIONS**

ASTM	American Society for Testing and Materials
AVS	acid volatile sulfide
BERA	Baseline Ecological Risk Assessment
CAS	Columbia Analytical Services
CLP	Contract Laboratory Program
DESR	Data Evaluation Summary Report
DQO	data quality objective
DW	dry weight
EA	EA Engineering, Science, and Technology, Inc.
EC20	Effects concentration 20 percent
EE/CA	Engineering Evaluation/Cost Analysis
EPA	U.S. Environmental Protection Agency
Gulfco	Gulfco Marine Maintenance
LC50	Lethal Concentration for 50 percent of test animals
LCS	laboratory control spike
MCAWW	Methods for the Chemical Analysis of Water and Wastes
µg/L	microgram per liter
µmol/gOC	micromole per gram organic carbon
mg/kg	milligram per kilogram
mg/L	milligram per liter
MS/MSD	matrix spike/matrix spike duplicate
NFG	National Functional Guidelines
OC	organic carbon content
PAH	polynuclear aromatic hydrocarbon
PCA	Principal Components Analysis
PCB	polychlorinated biphenyl
PRP	Potentially Responsible Party
PSCR	Preliminary Site Characterization Report
QC	quality control
RL	reporting limit
RPD	relative percent difference
SAP	Sampling and Analysis Plan
SEM	simultaneously extracted metals
SOW	Statement of Work
SVOC	Semi-volatile organic compounds
TOC	Total Organic Carbon
URS	URS Corporation
VOC	volatile organic compound

## 1. INTRODUCTION

This Data Evaluation Summary Report (DESR) summarizes the supplemental surface soil, sediment, pore water, and surface water data collected by URS Corporation (URS) in August and September 2010 for the Gulfco Marine Maintenance Superfund (Gulfco) Site, which presented the samples associated with the toxicity testing performed to develop an Engineering Evaluation/Cost Analysis (EE/CA) and perform a Streamlined Ecological Risk Evaluation (SERE) at the Gulfco Site (Figure 1). URS documented the sampling activities associated with these samples and the evaluation of these data in the Final Preliminary Site Characterization Report (PSCR) (URS 2010b). EA Engineering, Science, and Technology, Inc. (EA) prepared this DESR for the U.S. Environmental Protection Agency (EPA) Region 6 as part of Task Order No. 0067-NSEE-06JZ under EPA Contract No. EP-W-06-004, in accordance with the Statement of Work (SOW) issued by EPA (EPA 2010).

The purpose of this Task Order is to develop an EE/CA and perform a SERE at the Gulfco Site. This is in support of a Non-Time Critical Removal Action that eliminates, reduces, or controls risks to human health and the environment. Specifically, the SERE involves the evaluation of surface soil, sediment, sediment pore water, and surface water and the potential for adverse ecological effects to soil- and sediment-dwelling invertebrates. According to the PSCR the August and September 2010 supplemental data collection activities were conducted in accordance with the EPA-approved PRP Baseline Ecological Risk Assessment (BERA) Work Plan and Sampling and Analysis Plan (SAP) (URS 2010a).

The purpose of this document is to summarize analytical data quality and usability in relation to the project-specific data quality objectives (DQOs) presented in the site-specific PRP BERA Work Plan and SAP (URS 2010a). No additional data was collected or usability evaluations performed beyond those presented in the URS reports. A summary of the data collection events and types of data collected for the PRP BERA is provided in Section 2.0. Data validation guidelines, responsibilities, and results are addressed in Section 3.0. Data quality is discussed in Section 4.0. A data evaluation is presented in Section 5.0, and the analytical data summary is presented in Section 6.0. EA performed further analysis or evaluation of the toxicity study and associated data presented in the Preliminary Site Characterization Report (PSCR) (URS, 2010b) and this analysis is included in Section 7.0 of this document. References and supporting tables, and figures are also included. The DESR information will be used to further support the alternative selection in the EE/CA.

## 2. DATA SUMMARY

This section summarizes the supplemental surface soil, surface water, pore water, sediment, and soil sampling data collected by URS for the PRP BERA.

### 2.1 NORTH AREA SOIL

In order to evaluate the North Area surface soil, six samples were collected from the Site (NAS01 through NAS06) (Figure 2) and three samples were collected from a

reference/background area (NAS07 through NAS09). The soil analytical results generated from implementation of the PRP BERA sampling as presented in the PSCR are summarized in Table 1.

The surface soil samples were analyzed for metals using Methods for the Chemical Analysis of Water and Wastes (MCAWW) 200.8, for organochlorine pesticides by SW-846 8081A, and for polychlorinated biphenyls (PCBs) by SW-846 8082. The surface soil samples were also analyzed for total organic carbon (TOC) using American Society for Testing and Materials (ASTM) D4129-82M. The laboratory reports for these samples are provided in Appendix A of the URS PSCR (URS 2010b).

## 2.2 WETLAND SEDIMENT AND SURFACE WATER

In order to evaluate the wetland sediment, seven samples were collected from the Site (EWSED01 through EWSED07) and two samples were collected from a reference/background area (EWSED08 and EWSED09). The locations of these samples are shown in Figure 3. The sediment and sediment pore water analytical results generated from implementation of the PRP BERA sampling as presented in the PSCR are summarized in Table 2 and Table 3, respectively.

The sediment samples and sediment pore water were analyzed for metals using MCAWW 200.8, for organochlorine pesticides by SW-846 8081A, and for semi-volatile organic compounds (SVOCs) by SW-846 8270C. The sediment samples were also analyzed for acid volatile sulfide (AVS) using 821/R-91-100, for simultaneously extracted metals (SEM) using SW-864 6010B, for total organic carbon using ASTM D4129-82M, and for grain size using ASTM D422 Modified. The laboratory reports for these samples are provided in Appendix A of the URS PSCR (URS 2010b).

A ratio of AVS versus SEM is typically performed to determine the potential for bioavailability of metals from sediments. An AVS/SEM ratio above one indicates that metal availability might be reduced due to sulfides and an AVS/SEM ratio less than one indicates that metals are potentially bioavailable because there is not enough sulfide present to bind the metals into sulfide complexes. Further evaluation of the AVS/SEM ratio and its correlation with metals concentrations or toxicity to organisms is provided in Section 7.0. In order to evaluate the wetland surface water, three samples were collected from the Site (EWSW01, EWSW03, and EWSW04). The locations of these samples are shown in Figure 4. The surface water analytical results generated from implementation of the PRP BERA sampling as presented in the PSCR are summarized in Table 4.

The surface water samples were analyzed for metals using MCAWW 200.8, for organochlorine pesticides by SW-846 8081A and for volatile organic compounds (VOCs) by SW-846 8260B. The laboratory reports for these samples are provided in Appendix A of the URS PSCR (URS 2010b).

## 2.3 INTRACOASTAL WATERWAY SEDIMENT

In order to evaluate the intracoastal waterway sediment, five samples were collected from the Site (EIWSED01 through EIWSED05) and two samples were collected from a reference/background area (EIWSED06 and EIWSED07). The locations of these samples are shown in Figure 5 and Figure 6, respectively. The sediment and sediment pore water analytical results generated from implementation of the PRP BERA sampling as presented in the PSCR are summarized in Table 5 and Table 6, respectively.

The sediment samples and sediment pore water were analyzed for organochlorine pesticides by SW-846 8081A and for SVOCs by SW-846 8270C. The sediment samples were also analyzed for TOC using ASTM D4129-82M. The laboratory reports for these samples are provided in Appendix A of the URS PSCR (URS 2010b).

## 3. DATA VALIDATION

This section summarizes the data validation for analytical data provided by URS and the supporting laboratory. Surface soil, sediment, sediment pore water, and surface water samples collected in 2010 were analyzed by Columbia Analytical Services (Kelso, Washington) (CAS); which holds Texas laboratory accreditation T104704427-09-1. URS reviewed the data packages from CAS using the guidance in the Contract Laboratory Program (CLP) National Functional Guidelines (NFG) for Inorganic Superfund Data Review (January 2010), the CLP NFG Guidelines for Superfund Organic Methods Data Review (June 2008), and the acceptance criteria in the Final BERA Work Plan and SAP (URS 2010a). The data validation by URS is documented in Appendix A of the URS PSCR (URS 2010b) and summarized below.

URS performed validation of project data on 10 percent of the samples, checking the reported data against the raw data for these samples. Data for selected analytes were recalculated from instrument reports in the CAS data packages. Reported data agreed with raw data from quantitation reports within the expected limits of error. Data were recalculated for several constituents as documented in Appendix A of the URS PSCR (URS 2010b). Calibrations and adjustments were verified and were found to be acceptable for SVOCs and VOCs. Calibration data were recalculated for several constituents as documented in Appendix A of the URS PSCR (URS 2010b).

## 4. DATA QUALITY

Surface soil, sediment, sediment pore water, and surface water samples collected in 2010 were analyzed by CAS. According to the CAS Final Analytical Reports for samples collected in August and September 2010 (as included in Appendix A of the URS PSCR [URS 2010b]), standard procedures for quality assurance and quality control (QC) were followed in the analysis and reporting. Reporting limits (RLs) were adjusted for sample size and matrix interference.

The data qualifiers listed on the data tables are defined below. Although some qualifiers indicate uncertainty regarding the identification and/or the quantity of the sample analyte, as a whole, the data are useable for the purposes of site characterization, risk assessment, and remedy selection.

- J The analyte was analyzed for, but the associated numerical value may not be consistent with the amount actually present; the value is an estimated quantity.
- JH Matrix spike (MS) recovery greater than acceptance criteria; bias high.
- JL Surrogate recovery less than control limits; bias low.
- U The chemical was analyzed, but was not detected at the quantitation limit.
- < Less than the reporting limit.

## 5. DATA EVALUATION

Analytical results associated with the 2010 sampling activities were evaluated by URS to determine if the data were of adequate quality and quantity to accurately address the ecological risk assessment questions described in the Final BERA Work Plan and SAP (URS 2010a). The URS data evaluation is presented in the URS PSCR (URS 2010b) and is summarized below.

### 5.1 PRECISION

Precision is the measure of the variability associated with an entire sampling and analysis process. It is the comparison among independent measurements as the result of repeated application of the same process under similar conditions. It is determined by analyzing field duplicate pairs and matrix spike/matrix spike duplicate (MS/MSD) pairs. Precision is expressed as the relative percent difference (RPD) of a pair of values (or results). Acceptance criteria for analytical methodologies are presented in the BERA Work Plan and SAP (URS 2010a). During the data validation process, field duplicate and MS/MSD results were evaluated for compliance with acceptance criteria for precision for each analytical methodology.

Field duplicate pairs were collected, analyzed, and evaluated for each analysis performed on aqueous and sediment samples. The aqueous field duplicates precision was acceptable using the selected criteria of 30 RPD. The sediment field duplicates precision was acceptable using the selected criteria of 50 RPD. The field duplicate precision is summarized in Table 5 of Appendix A of the URS PSCR (URS 2010b).

MS/MSD samples were collected, analyzed, and evaluated. Surrogate recoveries outside the SAP acceptance criterion are listed in Table 4 of Appendix A of the URS PSCR (URS 2010b).

### 5.2 ACCURACY

Accuracy is the degree to which a measurement agrees with its true value and is expressed as percent recovery; acceptance criteria for each analytical methodology are stated in the BERA Work Plan and SAP (URS 2010a). By comparing MS/MSD, laboratory control spikes (LCSs), and surrogate recoveries to associated QC limits, accuracy is assessed. Through the process of data validation, MS/MSD, LCS, and surrogate recoveries were evaluated for compliance with acceptance criteria for accuracy for each applicable analytical methodology. Evaluations of

percent recovery are documented in Appendix A of the URS PSCR (URS 2010b). Accuracy data were found to be within acceptance criteria.

### **5.3 REPRESENTATIVENESS**

Representativeness is a qualitative parameter and is defined by the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or a process or environmental condition. Sample results were evaluated for representativeness by examining items related to sample collection, including chain-of-custody documentation, sample labeling, collection dates, and condition of the samples upon receipt at the laboratory. Laboratory procedures were also examined, including anomalies reported by the laboratory, either upon receipt of the samples at the laboratory or during analytical processes; adherence to recommended holding times of samples prior to analysis; calibration of laboratory instruments; adherence to analytical methods; and completeness of data package documentation.

Equipment rinsate and laboratory method blank results were evaluated during the data validation process to determine whether equipment decontamination procedures (equipment rinsate blank) or laboratory conditions (method blanks) affected sample results. Analytes detected in field and laboratory blanks are listed in Table 3 Appendix A of the URS PSCR (URS 2010b) and additional details pertaining to the representativeness of the sample results are documented in Appendix A of the URS PSCR (URS 2010b).

### **5.4 COMPLETENESS**

Completeness is defined as the percentage of measurements judged to be valid. The validity of sample results is determined through the data validation process. All rejected (R-flagged) sample results are considered to be incomplete. Data that are qualified as estimated (J-flagged) or estimated non-detect (UJ-flagged) are considered to be valid and usable.

The number of valid results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set. The completeness of surface soil, sediment, surface water, and sediment pore water was 100 percent since no analytical data were rejected. The results are useable as reported.

The number of data points obtained divided by the number of planned data points is also used to evaluate completeness. This completeness was 100 percent for surface soils and sediments and 90 percent for water as one sediment pore water and one background surface water sample were not collected due to dry conditions at the sample locations. Additional details pertaining to the completeness of the sample results are documented in Appendix A of the URS PSCR (URS 2010b).

### **5.5 COMPARABILITY**

Comparability of the data is a qualitative parameter that expresses the confidence with which one data set may be compared to another. Comparability of the data is achieved by using standard methods for sampling and analysis, reporting data in standard units, normalizing results to standard conditions, and using standardized reporting formats and data validation procedures.

No method substitutions were observed that reduced the quality of the data for comparison purposes. Per the BERA Work Plan and SAP (URS 2010a), the newly collected data are fully comparable with similar data collected during previous investigations.

## 5.6 SENSITIVITY

Sensitivity is the measure of the signal from an instrument that represents an actual deflection or response above instrument noise. Analytical sensitivity is measured by the method detection limit or instrument detection limit and reported with the necessary dilution factors, preparation factors, and dry weight factors of an individual sample as the sample quantitation limit.

For this project, aqueous and solid media were sampled and analyzed using CLP methods. According to the report the contract-required detection limits for the analytes were sensitive enough for comparison to regulatory action levels.

## 6. DATA SUMMARY

No significant data quality issues were identified by URS (URS 2010b) for the August and September 2010 surface soil, sediment, sediment pore water, and surface water. According to the report these data are useable for the PRP BERA.

## 7. EVALUATION OF TOXICITY DATA

### 7.1 SUMMARY OF HYPOTHESIS TESTS FOR WETLAND SEDIMENTS, INTRACOASTAL WATERWAY SEDIMENTS, AND NORTH AREA SOILS

The toxicity test results data have been evaluated using alternate logical sequences and statistical test procedures than presented in the toxicity test reports (URS, 2010b). That analysis and findings are summarized here and the output files from the statistical analyses (run on CETIS: Comprehensive Environmental Toxicity Information System) for toxicity are included in Appendix A.

This analysis begins with the conceptual model that Wetland Sediments and Intracoastal Waterway Sediments are distinct exposure areas, with differing water quality and habitats. In this analysis, these areas, as well as the North Area soils, are evaluated independently.

Reference samples for each of these exposure areas may be pooled, to improve reliability in the characterization of reference conditions. Reference samples were pooled, in the following analyses, where it can be shown that the toxicological response to the individual reference sediments is not different.

There are certainly situations in which reference samples may not be pooled; for example, when different reference samples apply to different streams, or there is some important feature of the reference location that applies to only a subset of the site related samples.

This is not the case at this site (once the two distinct exposure areas are kept separate), where each reference location appears to be equally representative of site conditions, except for the lack of site-related contaminant impacts. In this case, reference samples should be pooled if they exhibit similar toxic responses, since the pooled statistics will increase power of subsequent hypothesis tests.

Hypothesis tests were performed in accordance with method guidance (EPA 1991, 1994, and EPA/USACE 2008). Replicate results were tested for normality using the Shapiro-Wilk test and homogeneity of variance using the variance ratio F test. Survival data were transformed using the arcsine-square root transformation prior to testing for normality and homogeneity of variance. If the data distributions passed these tests, parametric two sample t tests (equal variance) were used to compare reference samples (pooled if appropriate) with site samples. If the data did not pass the normality test, the nonparametric Wilcoxon rank sum two sample test was applied. If the data passed the normality test, but failed the homogeneity of variance test, then the parametric two sample t test was used assuming unequal variances. The output files from the statistical analyses (run on CETIS: Comprehensive Environmental Toxicity Information System) for toxicity are included in Appendix A.

### **7.1.1 Wetland Sediments**

Reference sediments for this exposure area are EWSED08 and 09. Testing was performed using *Leptocheirus plumulosus* and *Neanthes arenaceodentata*. Survival and growth responses for these two samples were compared, and they were not significantly different, for either test organism. Therefore the replicates were pooled, i.e., the EWSED REF data set included all replicates from the two samples, evaluated as a single reference condition. Pooling the similar references improves the power of subsequent tests, reducing the probability of a false negative conclusion in which the statistical test does not detect an actual adverse effect. The output files from the statistical analyses (run on CETIS: Comprehensive Environmental Toxicity Information System) for toxicity are included in Appendix A.

#### **7.1.1.1 Response of *Leptocheirus***

Survival was evaluated following the arcsine-square root transformation using the two sample t test. Site samples did not exhibit significantly reduced survival when compared with the pooled reference data set.

Growth was significantly lower in sample EWSED06 when compared with the pooled reference data set. The magnitude of the reduced growth appears to be ecologically significant with growth reduced by 74 percent in EWSED06 when compared to the reference sites.

#### **7.1.1.2 Response of *Neanthes***

In the wetland sediments exposure area, site samples did not exhibit statistically significant reduction in either survival or growth when compared with the pooled reference data set, based on the two sample t test.

### 7.1.2 Intracoastal Waterway Sediments

Reference sediments for this exposure area are EIWS06 and 07. Testing was performed using *Leptocheirus plumulosus* and *Neanthes arenaceodentata*. Survival and growth responses for these two samples were compared, and the responses were not significantly different from each other, for either test organism. Therefore the replicates were pooled, i.e., the EIWS06 REF data set included all replicates from the two samples, evaluated as a single reference condition. The output files from the statistical analyses (run on CETIS: Comprehensive Environmental Toxicity Information System) for toxicity are included in Appendix A.

#### 7.1.2.1 Response of *Leptocheirus*

In the Intracoastal Waterway sediments exposure area, site samples did not exhibit statistically significant reduction in either survival or growth compared with the pooled reference data set, based on the two sample t test.

#### 7.1.2.2 Response of *Neanthes*

In the Intracoastal Waterways sediments exposure area, site samples did not exhibit statistically significant reduction in either survival or growth when compared with the pooled reference data set. Survival data were not normally distributed so hypothesis tests were conducted using the Wilcoxon Rank Sum 2 sample test. Growth data passed both the normality and homogeneity of variance tests, so the 2 sample t test was used for the *Neanthes* growth data.

### 7.1.3 North Area Soils

Reference soils for this exposure area are NAS07, 08, and 09. Testing was performed using *Neanthes arenaceodentata*. Survival and growth responses for these three samples were compared. For both the survival and growth endpoints, NAS08 and 09 exhibited similar responses. Both of these reference samples, however, exhibited greater toxicity than NAS07, for both endpoints. Consequently, NAS08 and 09 were pooled prior to comparison to site samples. NAS07 was compared independently with site samples. The output files from the statistical analyses (run on CETIS: Comprehensive Environmental Toxicity Information System) for toxicity are included in Appendix A.

#### 7.1.3.1 Response of *Neanthes*

No site sample exhibited reduced survival when compared with either NAS07, or the pooled references consisting of NAS08 and 09. Hypothesis tests were performed using the 2 sample t test. No site samples exhibited reduced growth when compared with the pooled references consisting of NAS08 and 09. Growth in site sample NAS01 was 57 percent lower than growth in reference NAS07, and this effect was statistically significant. No other site sample exhibited reduced growth when compared with NAS07.

### 7.1.4 Summary

Growth was significantly lower in sample EWSED06 when compared with the pooled reference data set. The magnitude of the reduced growth appears to be ecologically significant with growth reduced 74 percent in EWSED06 when compared to reference sites. No other wetland sediment samples exhibited toxicity to *Leptocheirus* when compared with reference sites.

Site sample NAS01 exhibited reduced growth of *Neanthes* when compared with reference sample NAS07. No North Area Soils exhibited toxicity when compared to the other reference data set consisting of NAS08 and 09.

No other site soils or sediments exhibited toxicity when compared with appropriate reference samples. Specifically no significant toxicity was observed in the Intracoastal Waterway sediment exposure area. Wetland sediments did not exhibit toxicity to *Neanthes*.

## 7.2 SURFACE WATERS

Acute toxicity of three surface water samples to brine shrimp were tested. The results for Run 3 for all samples, which exhibited acceptable control survival for 72 hours, were independently checked. By relevant test method guidance (EPA 2002; EPA-821-R-02-012), the Probit Method is the preferred procedure for determining the Lethal Concentration for 50 percent of the test animals (LC50) if the data passes the chi-square test. The Probit Method was appropriate for the data from these tests, and was used. The results were generally consistent with those presented in the toxicity test reports (URS, 2010b):

- Samples EWSW01 and 04 did not exhibit acute toxicity (LC50 > 100 percent)
- Sample EWSW03 had an LC50 at 6 percent dilution.

URS used the trimmed Spearman-Karber procedure and found that EWSW01 and 04 were not toxic, while EWSW03 had an LC50 at 5 percent dilution.

## 7.3 IDENTIFICATION OF POTENTIAL STRESSORS

For exposure areas and toxicological endpoints that exhibited statistically significant toxicity, chemical and physical characteristics of the sediment were examined to determine if one or more potential stressors were significantly associated with the observed toxicity.

Initial steps in the Dose-Response Evaluation used techniques that are occasionally referred to as “data mining” techniques intended to identify relationships between parameters. Procedures used included development of correlation matrices and Principal Components Analysis (PCA). Upon review of findings of these statistical procedures, the concentrations of a selected number of indicator chemicals that are significantly associated with a 20 percent reduction in measurement endpoints (effects concentration 20 percent, or EC20) were estimated. EC20s were estimated by the smoothed linear interpolation procedure recommended by relevant EPA test methods (see for example, EPA 2000, Section 16.2.5.7).

It is generally true that statistical associations are not conclusive regarding cause and effect. Because many of the chemicals are significantly correlated with other chemicals in the samples, the ability to conclude cause and effect from the statistical analyses is difficult. A subset of chemicals with the strongest statistical association with adverse effects was selected as indicator chemicals for estimation of EC20s. It is possible that these chemicals are not the cause of the adverse effect; adverse effects may actually be caused by one or more other chemicals that are correlated with the indicator chemicals. Nonetheless, the indicator chemicals selected have the

strongest association with the adverse effects, and may be used to identify sediments that are likely to impair the benthic macroinvertebrate community.

Parameters evaluated included concentration of chemicals in bulk sediment, concentrations of organic chemicals normalized by the organic carbon content of the sediments/soils, concentrations of chemicals in pore water,  $\Sigma$ SEM/AVS,  $(\Sigma$ SEM-AVS)/OC, organic carbon content (OC), and grain size (indicated by percent grave, sand, silt, and clay).

The PCA procedure was implemented using SYSTAT 11 (SYSTAT Software, Inc. 2004). Two factors were sought. The first factor is a linear combination of the chemical concentrations that explains the largest portion of the variance in the concentration data. The second factor is orthogonal (not correlated) to the first and explains as much of the remaining variance in the data as possible.

### 7.3.1 Wetland Sediments

Exploratory correlation and PCA revealed that, although polynuclear aromatic hydrocarbon (PAH) compounds were strongly correlated with each other (co-located) they were not closely associated with the toxic endpoint (*Leptocheirus plumulosus* growth) (Appendix A). To reduce the number of variables considered in the analysis, Total PAHs and  $\Sigma$ (PAHs/OC) were determined, and individual PAH compounds were eliminated from the data set.

Correlation analysis showed that sediment grain size was not significantly associated with *Leptocheirus* growth, while zinc in bulk sediment,  $(\Sigma$ SEM-AVS)/OC, and copper in pore water were significantly negatively associated with *Leptocheirus* growth (Appendix A). Significant association is indicated at the 0.05 level of significance.

In this investigation, PCA was used primarily to examine and illustrate the relationships. Figure 7 illustrates the association of a reduced set of potential stressors with the two PCA Factors. This figure illustrates that PAHs (whether normalized for organic carbon or not) are not correlated with the toxic endpoints (they are orthogonal on Factor 2); while arsenic, copper, nickel, zinc, and  $(\Sigma$ SEM-AVS)/OC are negatively associated with both endpoints.

Pore water was not analyzed in all the samples that were analyzed for bulk sediment chemistry and SEM/AVS. Therefore the correlation analysis was performed separately (Appendix A). Copper was the only pore water analyte that was significantly negatively associated with *Leptocheirus plumulosus* growth at the 0.05 level of significance.

As a result of these analyses, the following analytes appear to be associated with the observed toxicity to *Leptocheirus plumulosus* in wetland sediments:

- Copper (pore water)
- Zinc (bulk sediment)
- $(\Sigma$ SEM-AVS)/OC

Correlation matrices for *Leptocheirus* growth versus bulk sediment chemistry and pore water chemistry are included in Appendix A.

### 7.3.2 North Area Soils

A limited number of potential stressors were quantified in the North Area Soils exposure area. These were barium, chromium, copper, and zinc. Chromium, copper, and zinc were significantly correlated with each other (co-located), while barium was not associated with the other metals analyzed. Chromium, copper, and zinc also appeared to be negatively associated with *Neanthes* growth, however the apparent relationships were not significant at the 0.10 level of significance, and are not investigated further here.

### 7.3.4 Surface Waters

Acute toxicity to *Artemia salina* was indicated in 1 of 3 samples. These samples were analyzed for copper, nickel, silver, and zinc. The data set is too small for quantitative statistical evaluation, however copper, at 8.54 µg/L, and silver are higher in the sample that exhibited acute toxicity to brine shrimp. If toxicity is attributable to copper, it appears that concentrations less than 3.4 µg /L would not cause toxicity to *Artemia salina*.

## 7.4 DOSE/RESPONSE EVALUATION

Concentrations that are significantly associated with 20 percent reduction in measurement endpoints were estimated using the smoothed linear interpolation method presented in several relevant EPA guidance manuals (see, for example, EPA 2000). The smoothed linear interpolation method synthetically creates a monotonically decreasing dose-response relationship, by averaging concentrations associated with similar measurement endpoint results in a systematic way. To illustrate the method, the following chart shows all dose-response data for *C. dilutus* survival as a function of benzo(a)anthracene concentrations in an example data set (not site-specific) and the smoothed function used to estimate EC20 by linear interpolation.

EC20s were estimated for *Leptocheirus plumulosus* growth for copper and zinc in bulk sediment and pore water, and ( $\Sigma$ SEM – AVS)/OC. The calculated EC20s are shown in Table 7. In addition, Table 7 summarizes whether the wetland sediment samples (i.e., 1 implies EWSED-01, and so on) exceed the EC20s and whether they exhibited toxicity to the growth endpoint.

Generally Table 7 demonstrates a correspondence between the observed toxicity and exceedances of the EC20s. Site 6, which exhibited toxicity exceeded the EC20s. Sites 1 and 2, which did not exhibit toxicity, do not exceed any of the EC20s.

Dose-response relationships are illustrated in Figures 9 and, 10. Figure 9 illustrates the relationship between zinc in sediment and *Leptocheirus plumulosus* growth. Figure 10 illustrates the relationship between ( $\Sigma$ SEM – AVS)/OC and *Leptocheirus plumulosus* growth. In each case a clear dose-response relationship is apparent. In most cases at least one site-related location exhibited less toxicity than the pooled reference locations. The 20 percent reduction growth, however, is calculated as the reduction from the pooled reference data.

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## **Tables**

**TABLE 1**  
**Page 1 of 1**  
**DATA SUMMARY FOR NORTH AREA SOILS**  
**GULFCO MARINE MAINTENANCE SUPERFUND SITE**

Sample ID	Location	Comments	4,4'-DDT	Aroclor-1254	Barium	Chromium	Copper	Zinc
NAS01	North Area Soil				272	97.3	221	5770
NAS02	North Area Soil		0.0075 J	0.093 J	163	27.2	26	296 JH
NAS02DUP	North Area Soil		0.015 J	0.16 J	261	23.1	24.9	307 J
NAS03	North Area Soil		0.0078	--	190	15.4	22.9	307 J
NAS04	North Area Soil		--	0.01	502	7.86	10.8	321 J
NAS05	North Area Soil		0.008	--	198	30.9	27.4	309 J
NAS06	North Area Soil		--	--	52.2	13.4	10.8	62.3 J
NAS07	North Area Soil	Background location BSS-01	--	--	340	12.4	10.1	501
NAS08	North Area Soil	Background location BSS-02	--	--	182	13.6	12.6	182
NAS09	North Area Soil	Background location BSS-03	--	--	172	13.3	11	63.1

Notes:

Values in mg/kg, dry weight

J = Estimated Concentration

H = Concentration Biased High

mg/kg = milligrams per kilograms

-- Not Analyzed

**TABLE 2**  
**Page 1 of 8**  
**DATA SUMMARY FOR WETLAND SEDIMENTS**  
**GULFCO MARINE MAINTENANCE SUPERFUND SITE**

Sample ID	Location	Date	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene
EWSED01	Wetland	8/12/2010	0.0038 J	0.0046 J	0.057	0.043
EWSED02	Wetland	8/12/2010	0.002 J	0.0018 J	0.041	0.032
EWSED02DUP	Wetland	8/12/2010	0.0026 J	0.0013 J	0.03	0.024
EWSED03	Wetland	8/13/2010	0.0068	0.0043 J	0.0032 J	0.005
EWSED04	Wetland	8/13/2010	0.0037 J	0.0026 J	0.0069	0.006
EWSED05	Wetland	8/12/2010	0.02	0.075	0.018	0.078
EWSED06	Wetland	8/12/2010	0.0016 J	0.0013 J	0.0008 J	0.0011 J
EWSED07	Wetland	8/13/2010	0.0053	0.009	0.0091	0.027
EWSED08	Wetland	8/13/2010	0.001 J	< 0.00088	< 0.00069	0.001 J
EWSED09	Wetland	8/13/2010	0.00061 J	< 0.00076	< 0.00059	< 0.00058

Notes:

Values in mg/kg, dry weight

IW = Intercoastal Waterway

J = Estimated Concentration

L = Concentration Biased Low

< indicates samples was below indicated detection limit.

mg/kg = milligrams per kilograms

AVS = Acid Volatile Sulfides

SEM = Simultaneously Extracted Metals

- Not Analyzed

**TABLE 2**  
**Page 2 of 8**  
**DATA SUMMARY FOR WETLAND SEDIMENTS**  
**GULFCO MARINE MAINTENANCE SUPERFUND SITE**

Sample ID	Arsenic	AVS/SEM	Benzo(a)pyrene	Benzo(g,h,i)perylene	Copper	Indeno(1,2,3-cd)pyrene
EWSED01	2.97	0.089	0.24	0.63	20.6	0.22
EWSED02	2.4	0.014	0.12	0.46	13.3	0.18
EWSED02DUP	2.51	--	0.097	0.35	14.6	0.16
EWSED03	5.36	0.002	0.028	0.058	25	0.034
EWSED04	4.35	0.039	0.04	0.076	20.3	0.064
EWSED05	3.06	0.002	0.79	0.68	28.9	0.79
EWSED06	3.23	0.084	0.01	0.019	28.1	0.019
EWSED07	5.94	0.005	0.087	0.1	30.7	0.1
EWSED08	2.92	6.4	0.014	0.017	15.8	0.019
EWSED09	2.58	0.062	0.0027 J	0.0032 J	11.7	0.0032 J

Notes:  
Values in mg/kg, dry weight  
IW = Intercoastal Waterway  
J = Estimated Concentration  
L = Concentration Biased Low  
< indicates samples was below indicated detection limit.  
mg/kg = milligrams per kilograms  
AVS = Acid Volatile Sulfides  
SEM = Simultaneously Extracted Metals  
-- Not Analyzed

**TABLE 2**  
**Page 3 of 8**  
**DATA SUMMARY FOR WETLAND SEDIMENTS**  
**GULFCO MARINE MAINTENANCE SUPERFUND SITE**

Sample ID	Lead	Nickel	4,4'-DDT	Endrin Aldehyde	Benzo(a)anthracene	Endrin ketone
EWSED01	17.2	18.9	< 0.001 J	0.0007 J	< 0.066 J	< 0.000093
EWSED02	12	15.6	< 0.00017	< 0.00012	< 0.043 J	< 0.000093
EWSED02DUP	14.7	17.3	< 0.00017	< 0.001 J	< 0.00072 J	< 0.0011 J
EWSED03	48.4	21.7	0.0028	0.00027 J	0.024	< 0.00011 J
EWSED04	37.4	16.9	--	--	0.031	--
EWSED05	76.1	14.4	< 0.019 J	0.0014 J	0.55	< 0.001 J
EWSED06	32.9	22.5	0.0012	< 0.00012	0.0069	< 0.000093
EWSED07	32.7	20.1	--	--	0.09	--
EWSED08	19.8	16.3	0.0014	0.00052 J	0.011	< 0.00012
EWSED09	17.4	16.5	0.0016	< 0.00012	0.0024 J	< 0.000093

Notes:  
Values in mg/kg, dry weight  
IW = Intercoastal Waterway  
J = Estimated Concentration  
L = Concentration Biased Low  
< indicates samples was below indicated detection limit.  
mg/kg = milligrams per kilograms  
AVS = Acid Volatile Sulfides  
SEM = Simultaneously Extracted Metals  
-- Not Analyzed

**TABLE 2**  
**Page 4 of 8**  
**DATA SUMMARY FOR WETLAND SEDIMENTS**  
**GULFCO MARINE MAINTENANCE SUPERFUND SITE**

Sample ID	Chrysene	gamma-chlordane	Dibenz(a,h)anthracene	Flourene	Flouranthene
EWSED01	0.39	< 0.00009	0.17	0.019	0.038
EWSED02	0.62	< 0.00009	0.11	0.013	0.023
EWSED02DUP	0.49	< 0.00009	0.094	0.011	0.019
EWSED03	0.064	< 0.00009	0.0074	0.0048	0.052
EWSED04	0.05	--	0.01	0.0032 J	0.076
EWSED05	0.77	< 0.00009	0.14	0.065	1.3
EWSED06	0.014	0.00025 J	0.0026 J	0.001 J	0.02
EWSED07	0.14	--	0.019	0.016	0.26
EWSED08	0.017	< 0.00012 J	0.003 J	0.00092 J	0.031
EWSED09	0.004	< 0.00023 J	< 0.0008	< 0.00061	0.0055

Notes:  
Values in mg/kg, dry weight  
IW = Intercoastal Waterway  
J = Estimated Concentration  
L = Concentration Biased Low  
< indicates samples was below indicated detection limit.  
mg/kg = milligrams per kilograms  
AVS = Acid Volatile Sulfides  
SEM = Simultaneously Extracted Metals  
-- Not Analyzed

**TABLE 2**  
**Page 5 of 8**  
**DATA SUMMARY FOR WETLAND SEDIMENTS**  
**GULFCO MARINE MAINTENANCE SUPERFUND SITE**

Sample ID	Phenanthrene	Pyrene	Total Organic Carbon	Zinc	GRAVEL, MEDIUM,%	GRAVEL, FINE,%
EWSED01	0.032	0.091	59400	115	2.52	3.49
EWSED02	0.016	0.14	24100	70.1	53.7	5.66
EWSED02DUP	0.014	0.11	30500	86.1	--	--
EWSED03	0.049	0.069	18200	585	47.9	7.73
EWSED04	0.041	0.075	16700	417	0.57	2.19
EWSED05	0.78	1.1	18100	595	0.34	2.64
EWSED06	0.013	0.021	21500	959	18.7	0.87
EWSED07	0.15	0.19	23900	318	--	--
EWSED08	0.015	0.027	46800	94.3	12.7	12.1
EWSED09	0.0024 J	0.0044 J	11200	88.3	1.97	2.31

Notes:  
Values in mg/kg, dry weight  
IW = Intercoastal Waterway  
J = Estimated Concentration  
L = Concentration Biased Low  
< indicates samples was below indicated detection limit.  
mg/kg = milligrams per kilograms  
AVS = Acid Volatile Sulfides  
SEM = Simultaneously Extracted Metals  
-- Not Analyzed

**TABLE 2**  
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**DATA SUMMARY FOR WETLAND SEDIMENTS**  
**GULFCO MARINE MAINTENANCE SUPERFUND SITE**

Sample ID	SAND, VERY COARSE, %	SAND, COURSE, %	SAND, MEDIUM, %	SAND, FINE, %	SAND, VERY FINE, %	SILT, %	CLAY, %	Acid-volatile sulfide, $\mu\text{mol/gsed}$
EWSED01	5.58	2.82	1.8	2.12	2.42	61.6	21.2	0.018 J
EWSED02	2.91	1.77	1.15	2.29	1.64	13.7	10.8	< 0.005
EWSED02DUP	--	--	--	--	--	--	--	--
EWSED03	4.83	3.01	1.75	1.93	0.93	29.2	1.7	< 0.004
EWSED04	2.88	3.18	2.98	7.02	4.59	81.4	0.6	0.05
EWSED05	2.83	4.49	4.93	8.91	6.96	38.7	27.5	< 0.004
EWSED06	0.67	0.41	0.27	2.06	1.24	21.6	61.7	0.33
EWSED07	--	--	--	--	--	--	--	--
EWSED08	8.04	3.92	1.93	2.62	2.51	44.3	14.6	2.04
EWSED09	1.35	0.54	0.4	1.87	5.24	40.4	48.5	0.004

Notes:

Values in mg/kg, dry weight

IW = Intercostal Waterway

J = Estimated Concentration

L = Concentration Biased Low

< indicates samples was below indicated detection limit.

mg/kg = milligrams per kilograms

AVS = Acid Volatile Sulfides

SEM = Simultaneously Extracted Metals

-- Not Analyzed

**TABLE 2**  
**Page 7 of 8**  
**DATA SUMMARY FOR WETLAND SEDIMENTS**  
**GULFCO MARINE MAINTENANCE SUPERFUND SITE**

Sample ID	Cadmium, SEM, µmol/gsed	Copper, SEM, µmol/gsed	Lead, SEM, µmol/gsed	Nickel, SEM, µmol/gsed	Zinc, SEM, µmol/gsed	ΣSEM, µmol/gsed	ΣSEM/AVS
EWSED01	< 0.0006	0.024	0.015	0.015	0.148	0.2	11.3
EWSED02	0.0007	0.03	0.029	0.03	0.259	0.3	69.7
EWSED02DUP	--	--	--	--	--	--	--
EWSED03	0.0011	0.057	0.038	0.012	1.55	1.7	415
EWSED04	0.0012	0.16	0.088	0.016	1.02	1.3	25.7
EWSED05	< 0.0005	0.082	0.055	0.011	1.74	1.9	472
EWSED06	0.0019	0.092	0.04	0.019	3.79	3.9	11.9
EWSED07	--	--	--	--	--	0.7	184
EWSED08	< 0.0008	0.016	0.021	0.028	0.255	0.3	0.157
EWSED09	< 0.0005	0.011	0.009	0.005	0.039	0.1	16.1

Notes:

Values in mg/kg, dry weight

IW = Intercoastal Waterway

J = Estimated Concentration

L = Concentration Biased Low

< indicates samples was below indicated detection limit.

mg/kg = milligrams per kilograms

AVS = Acid Volatile Sulfides

SEM = Simultaneously Extracted Metals

-- Not Analyzed

**TABLE 2**  
**Page 8 of 8**  
**DATA SUMMARY FOR WETLAND SEDIMENTS**  
**GULFCO MARINE MAINTENANCE SUPERFUND SITE**

Sample ID	foc,goc/gsed	$\Sigma$ SEM-AVS, μmol/gsed	$(\Sigma$ SEM-AVS)/foc, μmol/goc
EWSED01	0.0594	0.185	3.1
EWSED02	0.0273	0.344	12.6
EWSED02DUP	--	--	--
EWSED03	0.0182	1.654	90.9
EWSED04	0.0167	1.235	74
EWSED05	0.0181	1.885	104.1
EWSED06	0.0215	3.613	168
EWSED07	0.0239	0.731	30.6
EWSED08	0.0468	--	--
EWSED09	0.0112	0.061	5.4

Notes:  
Values in mg/kg, dry weight  
IW = Intercostal Waterway  
J = Estimated Concentration  
L = Concentratin Biased Low  
< indicates samples was below indicated detection limit.  
mg/kg = milligrams per kilograms  
AVS = Acid Volatile Sulfides  
SEM = Simultaneously Extracted Metals  
-- Not Analyzed

**TABLE 3**  
**Page 1 of 5**  
**DATA SUMMARY TABLE FOR WETLAND SEDIMENT PORE WATER**  
**GULFCO MARINE MAINTENANCE SUPERFUND SITE**

Sample ID	2-Methylnaphthalene	4,4'-DDT	Acenaphthene	Acenaphthylene
EWSED01	0.000018 U	< 0.000012 J	< 0.0000052	0.000024
EWSED02	0.000026 U	< 0.0000047 J	< 0.0000044	< 0.0000034
EWSED03	0.000022 U	< 0.000016 J	< 0.0000047	< 0.0000036
EWSED04	0.000046	--	< 0.0000085 J	0.000014 J
EWSED04DUP	--	--	--	--
EWSED06	0.000019 U	< 0.00000058	0.0000091 J	< 0.0000035
EWSED07	0.000013 U	--	< 0.000012	0.000032 J
EWSED08	0.0000083 U	0.000003 J	< 0.000005	< 0.0000039
EWSED09	0.000018 U	< 0.0000014 J	< 0.0000044	< 0.0000034

Notes:

Values in mg/L

mg/L = milligrams/liter

< or U indicates samples was below  
indicated detection limit.

J = Estimated Concentration

-- Not Analyzed

**TABLE 3**  
**Page 2 of 5**  
**DATA SUMMARY TABLE FOR WETLAND SEDIMENT PORE WATER**  
**GULFCO MARINE MAINTENANCE SUPERFUND SITE**

Sample ID	Anthracene	Arsenic	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(g,h,i)perylene
EWSED01	0.000067	0.0037 J	< 0.0000031	< 0.0000051	0.000012 J
EWSED02	< 0.0000036	0.0041 J	< 0.0000026	< 0.0000043	0.000012 J
EWSED03	0.000013 J	0.0019 J	< 0.0000028	< 0.0000046	< 0.0000031
EWSED04	0.000047	0.00072 J	< 0.0000026	< 0.0000043	< 0.0000029
EWSED04DUP	--	0.00325	--	--	--
EWSED06	< 0.0000037	0.00177 J	0.0000095 U	0.0000097 U	0.000023 U
EWSED07	0.000066	0.00063 J	< 0.0000067	< 0.000012	< 0.0000075
EWSED08	< 0.0000041	0.00576 J	< 0.000003	< 0.0000049	< 0.0000033
EWSED09	< 0.0000036	0.00171 J	< 0.0000026	< 0.0000043	< 0.0000029

Notes:

Values in mg/L

mg/L = milligrams/liter

< or U indicates samples was below indicated detection limit.

J = Estimated Concentration

-- Not Analyzed

**TABLE 3**  
**Page 3 of 5**  
**DATA SUMMARY TABLE FOR WETLAND SEDIMENT PORE WATER**  
**GULFCO MARINE MAINTENANCE SUPERFUND SITE**

Sample ID	Chrysene	Copper	Dibenz(a,h)anthracene	Endrin Aldehyde
EWSED01	< 0.000004	0.000922	< 0.000003	0.000013
EWSED02	0.000049	0.000342 U	0.0000034 J	0.0000067 J
EWSED03	< 0.0000036	0.00456	< 0.0000027	0.000015 J
EWSED04	< 0.0000034	0.00426	< 0.0000025	--
EWSED04DUP	--	0.00531 U	--	--
EWSED06	0.0000096 U	0.00702	0.000015 U	< 4.6E-07
EWSED07	< 0.0000088	0.00303	< 0.0000065	--
EWSED08	< 0.0000039	0.00137	< 0.0000029	0.0000026 J
EWSED09	< 0.0000034	0.000761 U	< 0.0000025	< 0.0000033 J

Notes:  
Values in mg/L  
mg/L = milligrams/liter  
< or U indicates samples was below indicated detection limit.  
J = Estimated Concentration  
-- Not Analyzed

**TABLE 3**  
**Page 4 of 5**  
**DATA SUMMARY TABLE FOR WETLAND SEDIMENT PORE WATER**  
**GULFCO MARINE MAINTENANCE SUPERFUND SITE**

Sample ID	Endrin ketone	Flourene	Fluoranthene	gamma-Chlordane
EWSED01	< 0.00000078	0.000013 J	< 0.0000052	< 0.00000038
EWSED02	< 0.0000013 J	< 0.0000038	< 0.0000044	< 0.0000013 J
EWSED03	0.000007 J	< 0.000004	< 0.0000047	< 0.000016 J
EWSED04	--	0.0000047 J	< 0.0000044	--
EWSED04DUP	--	--	--	--
EWSED06	< 0.00000066	0.0000091 J	< 0.0000045	< 0.00000032
EWSED07	--	< 0.0000098	< 0.000012	--
EWSED08	< 0.0000007	< 0.0000044	< 0.000005	0.0000033 J
EWSED09	< 0.0000011	< 0.0000038	< 0.0000044	< 0.000016 J

Notes:

Values in mg/L

mg/L = milligrams/liter

< or U indicates samples was below indicated detection limit.

J = Estimated Concentration

-- Not Analyzed

**TABLE 3**  
**Page 5 of 5**  
**DATA SUMMARY TABLE FOR WETLAND SEDIMENT PORE WATER**  
**GULFCO MARINE MAINTENANCE SUPERFUND SITE**

Sample ID	Indeno(1,2,3-cd)pyrene	Lead	Nickel	Phenanthrene	Pyrene	Zinc
EWSED01	0.0000051 J	0.000115 U	0.00944	0.000012 J	< 0.0000042	0.0101
EWSED02	0.0000062 J	0.000113 U	0.00486	< 0.000005	< 0.0000035	0.00135 U
EWSED03	< 0.0000028	0.000425 U	0.00749 U	0.0000053 U	< 0.0000037	0.0413
EWSED04	< 0.0000026	0.00015 U	0.0114	< 0.000005	< 0.0000035	0.101
EWSED04DUP	--	0.000239 U	--	--	--	0.083
EWSED06	0.000014 U	0.000443 U	0.00915	0.0000068 J	< 0.0000036	0.626
EWSED07	< 0.0000067	0.000184	0.00917	< 0.000013	< 0.000009	0.0599
EWSED08	< 0.000003	0.00128 U	0.0142	< 0.0000057	< 0.000004	0.039
EWSED09	< 0.0000026	0.000236 U	0.00669	< 0.000005	< 0.0000035	0.00124 U

Notes:

Values in mg/L

mg/L = milligrams/liter

< or U indicates samples was below indicated detection limit.

J = Estimated Concentration

-- Not Analyzed

**TABLE 4**  
**Page 1 of 1**  
**DATA SUMMARY FOR WETLAND SURFACE WATER**  
**GULFCO MARINE MAINTENANCE SUPERFUND SITE**

Sample ID	Acrolein	Copper	Nickel	Silver	Zinc
EWSW01	<0.00096	0.00338 J	0.00616	0.00002 J	0.029
EWSW01DUP	<0.00096	0.00331	0.00601	0.000021 J	0.0279
EWSW03	--	0.00854	0.00474	0.000049	0.0242
EWSW04	--	0.00154	0.00396	0.000011 J	0.122

Notes:  
Values in mg/L  
mg/L = milligrams/liter  
< indicates samples was below indicated detection limit.  
J = Estimated Concentration  
-- Not Analyzed

**TABLE 5**  
**Page 1 of 2**  
**DATA SUMMARY FOR INTERCOASTAL WATERWAY SEDIMENTS**  
**GULFCO MARINE MAINTENANCE SUPERFUND SITE**

Sample ID	Location	4,4'-DDT	Acenaphthene	Benzo(a)anthracene	Chrysene	Dibenz(a,h)anthracene
EIWSED01	IW	0.00023 J	0.0071	0.03	0.046	0.0046
EIWSED02	IW	0.0019	0.023	0.24	0.31	0.063
EIWSED03	IW	0.00032 J	0.0052	0.052	0.07	0.015
EIWSED03DUP	IW	0.00089 J	0.0022 J	0.048	0.067	0.014
EIWSED04	IW	--	0.0029 J	0.032	0.054	0.0087 J
EIWSED05	IW	0.00029 J	0.0046 J	0.042	0.059	0.01
EIWSED06	IW	< 0.00017	< 0.0014 JL	< 0.0017 JL	0.0019	< 0.0015 JL
EIWSED07	IW	< 0.00017	< 0.0014 JL	< 0.0017 JL	< 0.0015	< 0.0015 JL

Notes:

Values in mg/kg, dry weight

IW = Intercoastal Waterway

J = Estimated Concentration

L = Concentration Biased Low

< indicates samples was below indicated detection limit.

mg/kg = milligrams per kilograms

-- Not Analyzed

**TABLE 5**  
**Page 2 of 2**  
**DATA SUMMARY FOR INTERCOASTAL WATERWAY SEDIMENTS**  
**GULFCO MARINE MAINTENANCE SUPERFUND SITE**

Sample ID	Fluoranthene	Fluorene	Hexachlorobenzene	Phenanthrene	Pyrene	Total Organic Carbon
EIWSED01	0.12	0.019	--	0.15	0.081	4130
EIWSED02	0.52	0.02	--	0.24	0.47	7200
EIWSED03	0.12	0.0067	--	0.071	0.1	6320
EIWSED03DUP	0.094	0.0032 J	--	0.043	0.11	6680
EIWSED04	0.074	0.0031 J	< 0.0012	0.028	0.073	5480
EIWSED05	0.1	0.0045 J	--	0.051	0.054	6820
EIWSED06	0.0019 JL	< 0.0011 JL	< 0.0012 JL	< 0.0014 JL	0.0025 JL	6060
EIWSED07	0.0018 JL	< 0.0011 JL	< 0.0012 JL	< 0.0014 JL	0.0018 JL	5090

Notes:  
Values in mg/kg, dry weight  
IW = Intercostal Waterway  
J = Estimated Concentration  
L = Concentration Biased Low  
< indicates samples was below indicated detection limit.  
mg/kg = milligrams per kilograms  
-- Not Analyzed

**TABLE 6**  
**Page 1 of 2**  
**DATA SUMMARY FOR INTERCOASTAL WATERWAY SEDIMENTS PORE WATER**  
**GULFCO MARINE MAINTENANCE SUPERFUND SITE**

Sample ID	4,4'-DDT	Acenaphthene	Benzo(a)anthracene	Chrysene	Dibenz(a,h)anthracene
EIWSED01	< 0.0000035 J	0.000052	< 0.0000035	< 0.0000046	< 0.0000034
EIWSED02	< 0.00000098 J	0.000037	< 0.0000028	< 0.0000037	< 0.0000027
EIWSED03	< 0.0000013 J	0.000024	< 0.0000026	< 0.0000034	< 0.0000025
EIWSED04	< 0.00000076 J	< 0.0000088	< 0.0000052	< 0.0000068	< 0.000005
EIWSED05	< 0.0000013 J	0.000027	< 0.0000034	< 0.0000044	< 0.0000033
EIWSED05DUP	< 0.0000016 J	0.000031	< 0.0000028	< 0.0000036	< 0.0000027
EIWSED06	< 0.000001 J	< 0.0000088	< 0.0000052	< 0.0000068	< 0.000005
EIWSED07	< 0.00000058	< 0.000026	< 0.000018	< 0.000028	< 0.000017

Notes:  
Values in mg/l  
mg/l = milligrams/liter  
< indicates samples was below indicated detection limit.  
J = Estimated Concentration  
-- Not Analyzed

**TABLE 6**  
**Page 2 of 2**  
**DATA SUMMARY FOR INTERCOASTAL WATERWAY SEDIMENTS PORE WATER**  
**GULFCO MARINE MAINTENANCE SUPERFUND SITE**

Sample ID	Fluoranthene	Fluorene	Hexachlorobenzene	Phenanthrene	Pyrene
EIWSED01	< 0.0000059	0.000043	< 0.00000035	0.000031	< 0.0000047
EIWSED02	< 0.0000048	0.000029	< 0.00000031	0.000022	J < 0.0000038
EIWSED03	< 0.0000044	0.00002	J < 0.00000039	0.000012	J < 0.0000035
EIWSED04	< 0.0000088	< 0.0000076	< 0.00000037	< 0.00001	< 0.000007
EIWSED05	< 0.0000057	0.000023	J < 0.00000037	0.000015	J < 0.0000045
EIWSED05DUP	< 0.0000047	0.000026	< 0.00000044	0.000015	J < 0.0000037
EIWSED06	< 0.0000088	< 0.0000076	< 0.00000039	< 0.00001	< 0.000007
EIWSED07	< 0.00002	< 0.000027	< 0.000022	< 0.000022	< 0.000019

Notes:

Values in mg/l

mg/l = milligrams/liter

< indicates samples was below

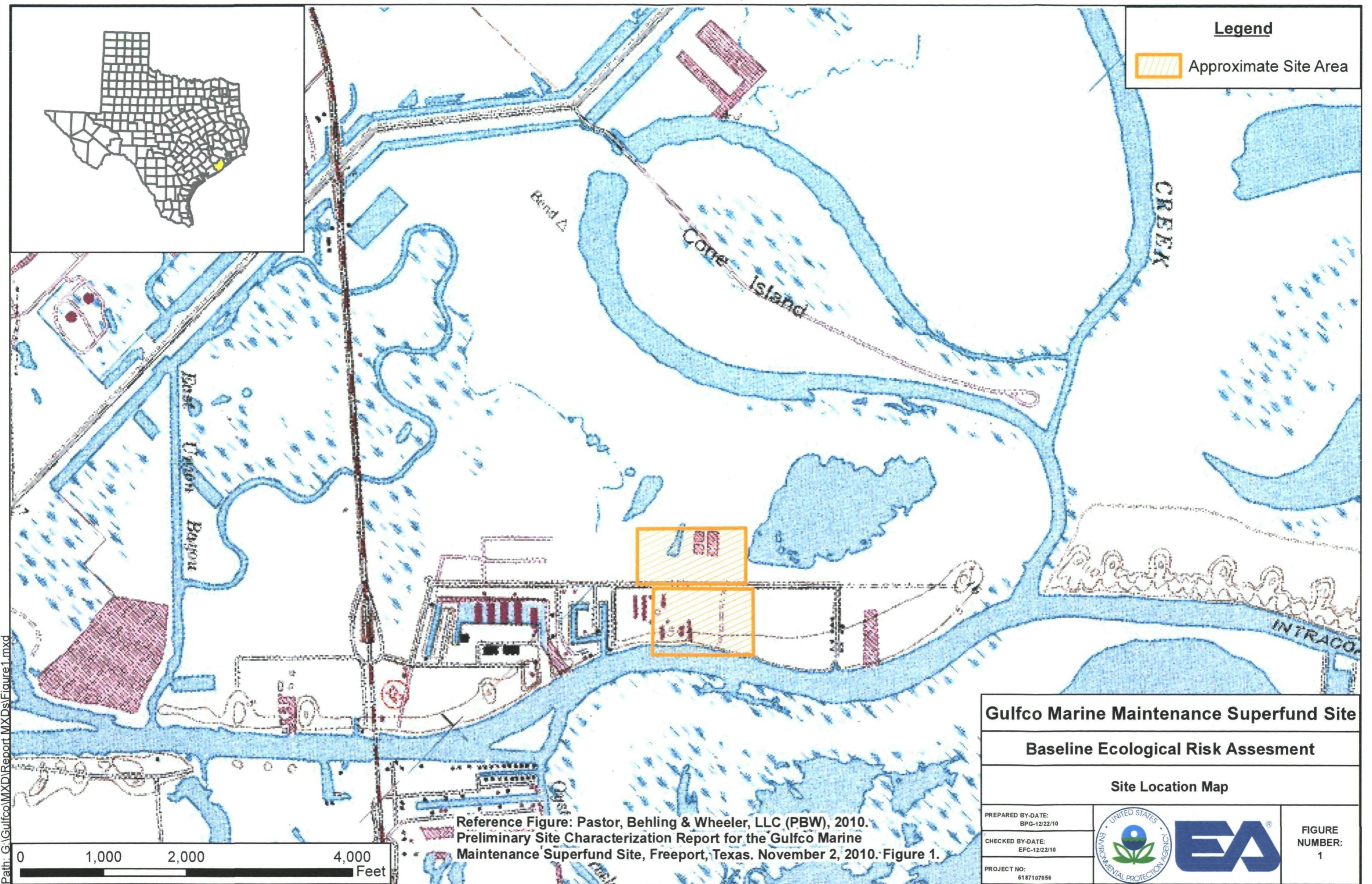
J = Estimated Concentration

-- Not Analyzed

**TABLE 7**  
**Page 1 of 1**  
**SUMMARY EC20s AND TOXICITY**  
**GULFCO MARINE MAINTENANCE SUPERFUND SITE**

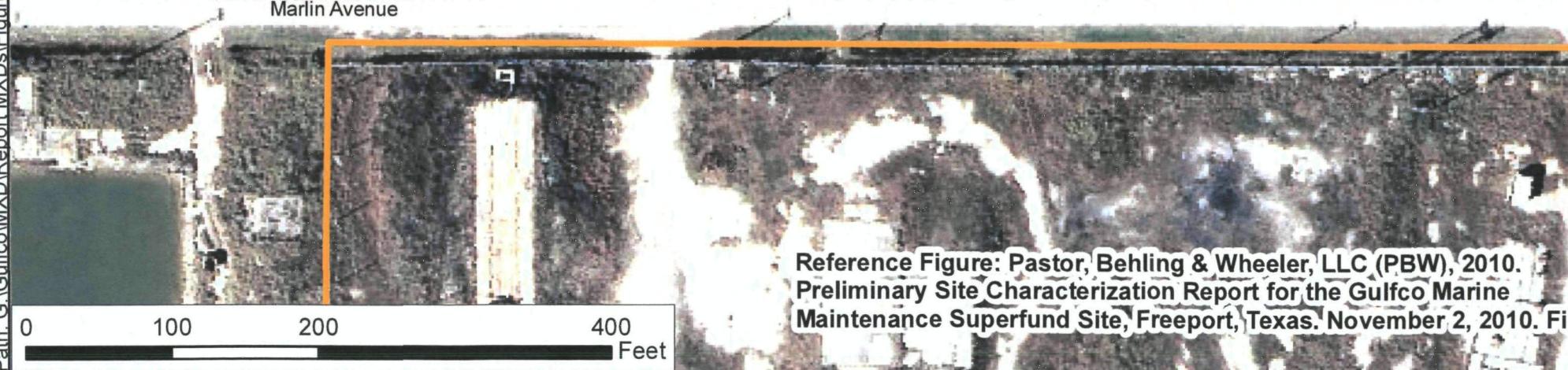
Stressor	EC20	Locations Exceeding EC20						
		EWSED0 1	EWSED0 2	EWSED0 3	EWSED0 4	EWSED0 5	EWSED0 6	EWSED0 7
Copper (mg/kg DW)	>28.2							
Copper (mg/L)	0.0045			X			X	
Zinc (mg/kg DW)	734						X	
Zinc (mg/L)	0.245						X	
(SSEM-AVS)/OC (mmol/gOC)	126						X	
<b>Toxicity Observed?</b>				X	X		X	X
<i>Leptocheirus plumulosus</i> Growth								
Copper (mg/kg DW)	24.8			X		X	X	X
Copper (mg/L)	0.00271			X	X		X	X
Zinc (mg/kg DW)	284			X	X	X	X	X
Zinc (mg/L)	0.0495				X		X	X
(SSEM-AVS)/OC (mmol/gOC)	25.4			X	X	X	X	X
<b>Toxicity Observed?</b>				X			X	

## **Figures**





Path: G:\Gulfco\MXD\Report MXDs\Figure2.mxd



Reference Figure: Pastor, Behling & Wheeler, LLC (PBW), 2010.  
Preliminary Site Characterization Report for the Gulfco Marine  
Maintenance Superfund Site, Freeport, Texas. November 2, 2010. Figure 3.

## Gulfco Marine Maintenance Superfund Site

### Baseline Ecological Risk Assessment

#### North Area Soil Sample Locations

PREPARED BY-DATE:  
BPG-12/22/10  
  
CHECKED BY-DATE:  
EFC-12/22/10  
  
PROJECT NO:  
6187107056



FIGURE  
NUMBER:  
2



### Legend

- Approximate Site Area
- Sediment Reference Location
- Sediment Sample Location







Path: G:\Gulfo\MXD\Report MXDs\Figure5.mxd

### Legend

- Approximate Site Area
  - Intracoastal Waterway Sediment Sample Locations
- 0 100 200 400 Feet

## Intracoastal Waterway

Reference Figure: Pastor, Behling & Wheeler, LLC (PBW), 2010.  
Preliminary Site Characterization Report for the Gulfco Marine  
Maintenance Superfund Site, Freeport, Texas. November 2, 2010. Figure 6.

### Gulfco Marine Maintenance Superfund Site

#### Baseline Ecological Risk Assessment

#### Intracoastal Waterway Sediment Sample Locations

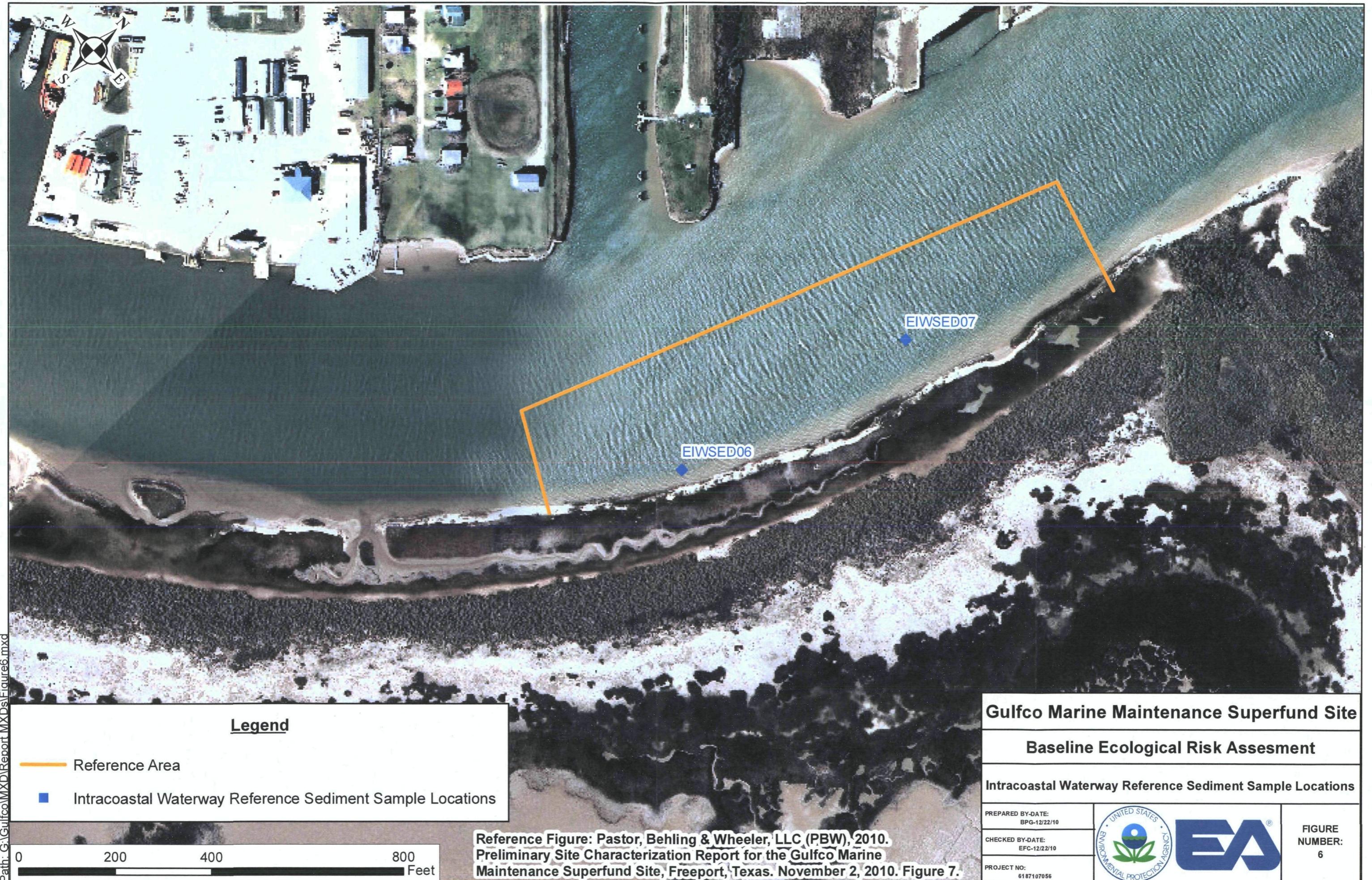
PREPARED BY-DATE:  
BPG-12/22/10

CHECKED BY-DATE:  
EFC-12/22/10

PROJECT NO:  
6187107056



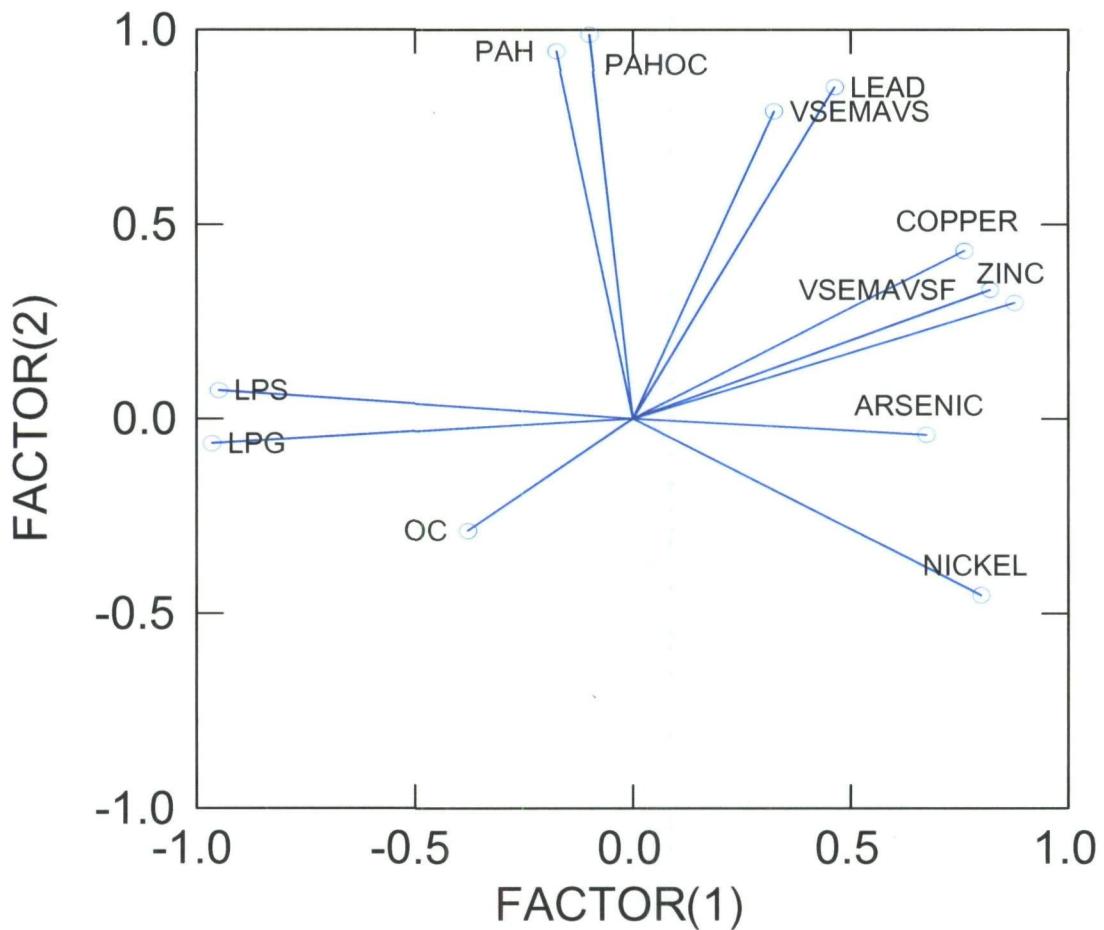
FIGURE  
NUMBER:  
5



**FIGURE 7**

**BULK SEDIMENT CHEMISTRY AND SEM/AVS ASSOCIATIONS WITH *LEPTOCHIRUS PLUMULOSUS* SURVIVAL AND GROWTH**

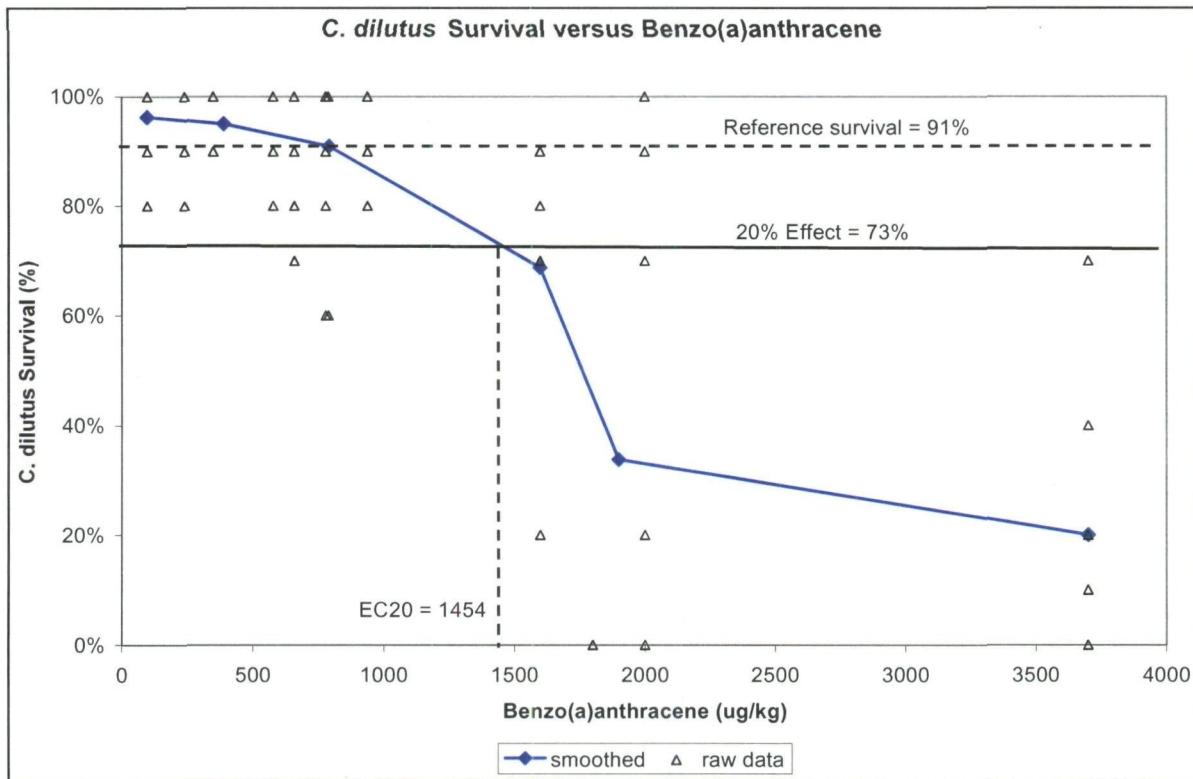
**Factor Loadings Plot**



Notes:

LPS = *Leptocheirus plumulosus* survival; LPG = *Leptocheirus plumulosus* growth; VSEMAVS =  $\Sigma$ SEM/AVS; VSEMAVSF =  $(\Sigma$ SEM – AVS)/OC

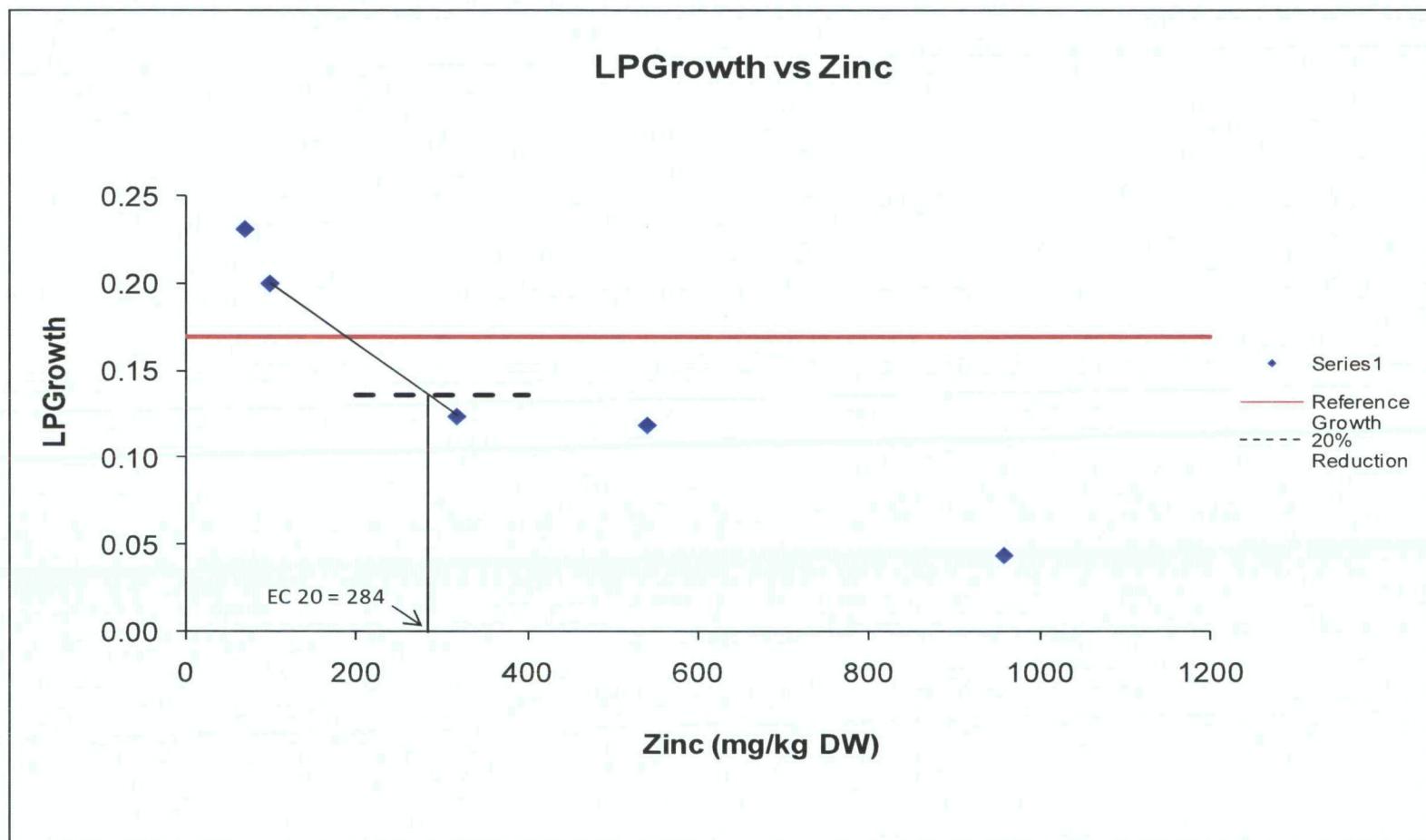
**FIGURE 8**  
**ILLUSTRATION OF EC<sub>20</sub> CALCULATION BY SMOOTHED LINEAR  
INTERPOLATION METHOD**



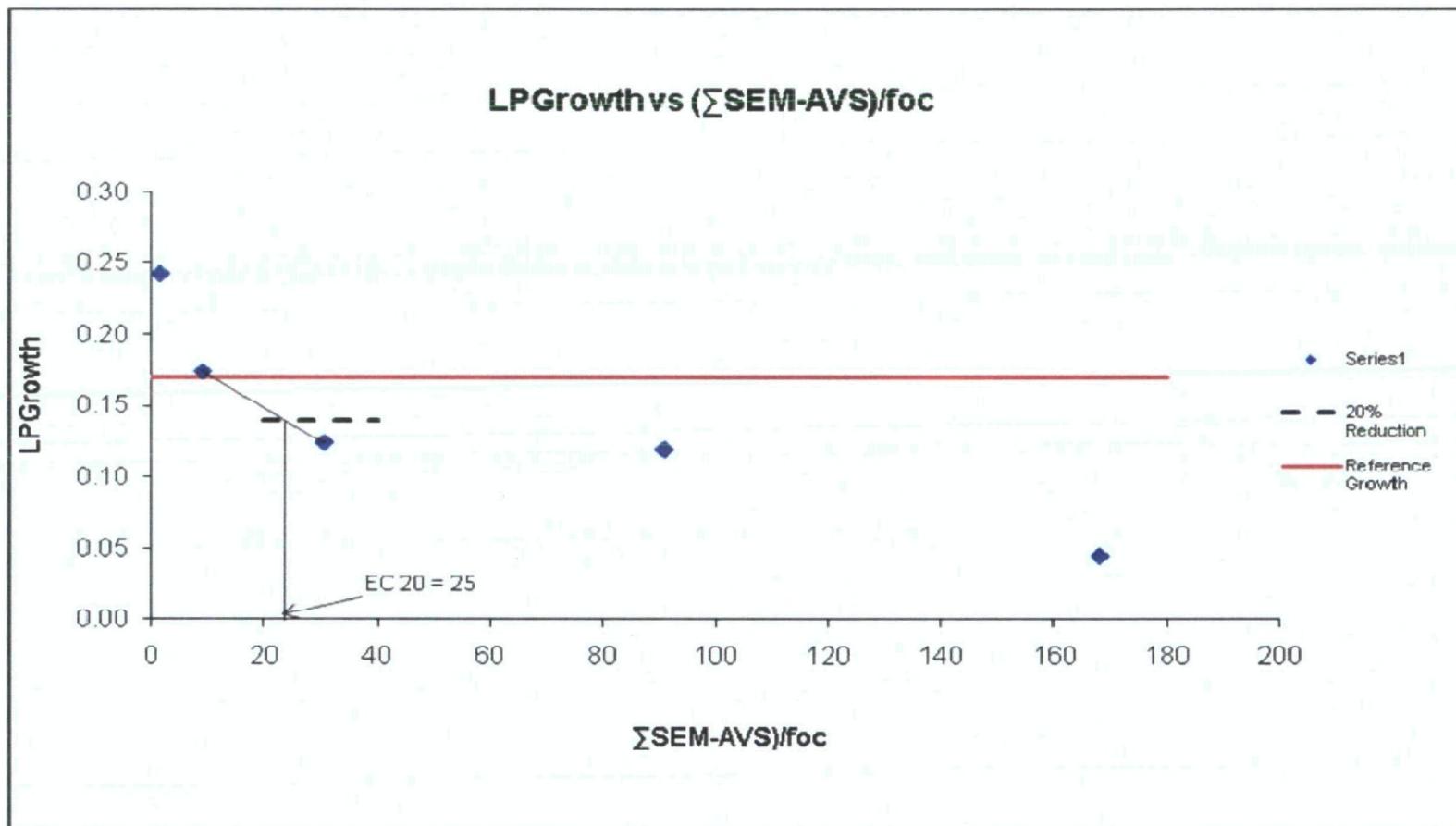
Created by: JAT  
 Checked by: WAT  
 Source: MACTEC 2003

**FIGURE 9**

***LEPTOCHEIRUS PLUMULOSUS* GROWTH VERSUS ZINC IN SEDIMENT**



**FIGURE 10**  
***LEPTOCHEIRUS PLUMULOSIS* GROWTH VERSUS  $(\Sigma SEM - AVS)/OC$**



## **Appendix A**

**Correlation Matrices Relating Potential Stressors to *Leptocheirus plumulosus*  
Toxicity Endpoints in Wetland Sediments and CETIS Analytical Reports**

**Correlation Matrix - Reduced Set of Bulk Sediment Analytes versus *Leptocheirus* Survival and Growth**

	PAH	PAHOC	Arsenic	Copper	Lead	Nickel	TOTAL ORGANIC CARBON	Zinc	SEM/AVS	(SEM-AVS) /foc	LPG
PAH	1.000										
PAHOC	0.979	1.000									
Arsenic	-0.183	-0.143	1.000								
Copper	0.369	0.389	0.626	1.000							
Lead	0.690	0.775	0.327	0.692	1.000						
Nickel	-0.507	-0.517	0.551	0.503	-0.048	1.000					
TOTAL ORGANIC CARBON	-0.034	-0.196	-0.235	-0.127	-0.406	0.017	1.000				
Zinc	0.138	0.226	0.305	0.741	0.637	0.554	-0.408	1.000			
SEM/AVS	0.643	0.698	0.404	0.562	0.853	-0.013	-0.360	0.390	1.000		
(SEM-AVS)/foc	0.170	0.264	0.208	0.665	0.634	0.465	-0.454	0.989	0.369	1.000	
LPG	0.271	0.129	-0.481	-0.461	-0.390	-0.574	<b>0.738</b>	<b>-0.761</b>	-0.227	<b>-0.738</b>	1.000

r is significant at 0.05 if absolute value >0.666

LPG = *Leptocheirus* growth

PAHOC = Total PAHs/OC

### Correlation Matrix

#### Pore Water Concentrations v Leptocheirus Survival and Growth

	<i>2mnapPW</i>	<i>acenapPW</i>	<i>acenapyPW</i>	<i>AnthracenePW</i>	<i>ArsenicPW</i>	<i>BghiPPW</i>	<i>CopperPW</i>	<i>indeno123PPW</i>	<i>LeadPW</i>
<i>2mnapPW</i>	1.000								
<i>acenapPW</i>	0.077	1.000							
<i>acenapyPW</i>	-0.055	0.625	1.000						
<i>AnthracenePW</i>	0.151	0.521	0.957	1.000					
<i>ArsenicPW</i>	-0.443	-0.635	-0.339	-0.351	1.000				
<i>BghiPPW</i>	-0.135	0.272	-0.015	-0.074	0.020	1.000			
<i>CopperPW</i>	0.244	0.554	-0.083	-0.046	-0.551	0.400	1.000		
<i>indeno123PPW</i>	-0.184	0.478	0.006	-0.102	-0.140	0.950	0.559	1.000	
<i>LeadPW</i>	-0.509	-0.203	-0.398	-0.455	0.610	-0.185	0.019	-0.102	1.000
<i>NickelPW</i>	-0.107	0.244	0.170	0.210	0.244	-0.212	0.172	-0.138	0.682
<i>chrysenePW</i>	0.119	-0.196	-0.222	-0.293	0.295	0.323	-0.329	0.227	-0.277
<i>DibenzahAPW</i>	-0.187	0.557	-0.041	-0.148	-0.257	0.845	0.710	0.960	0.018
<i>FluorenePW</i>	-0.275	0.448	0.723	0.697	-0.103	0.551	0.131	0.486	-0.276
<i>fluoranPW</i>	-0.354	0.730	0.788	0.599	-0.360	-0.050	0.012	0.120	-0.144
<i>PhenanPW</i>	-0.389	0.530	0.908	0.813	-0.153	0.243	-0.071	0.242	-0.270
<i>PyrenePW</i>	-0.364	0.727	0.796	0.609	-0.347	-0.044	0.004	0.123	-0.139
<i>ZincPW</i>	0.004	0.443	-0.214	-0.245	-0.249	0.780	0.807	0.874	0.084
LPG	-0.210	-0.458	0.193	0.208	0.766	-0.116	<b>-0.825</b>	-0.335	0.110

r is significant at 0.05 if absolute value >0.707

LPG = *Leptocheirus* growth

**Correlation Matrix****Pore Water Concentrations v Leptocheirus Survival and Growth**

<i>NickelPW</i>	<i>chrysenePW</i>	<i>DibenzahAPW</i>	<i>FluorenePW</i>	<i>fluoranPW</i>	<i>PhenanPW</i>	<i>PyrenePW</i>	<i>ZincPW</i>	<i>LPG</i>
1.000								
-0.594	1.000							
-0.001	0.011	1.000						
0.136	-0.234	0.408	1.000					
0.073	-0.091	0.134	0.428	1.000				
0.105	-0.195	0.171	0.884	0.760	1.000			
0.084	-0.097	0.134	0.445	1.000	0.773	1.000		
0.103	-0.092	0.949	0.276	-0.122	-0.049	-0.123	1.000	
0.109	0.352	-0.533	0.160	-0.062	0.229	-0.047	-0.598	1.000

**CETIS Analytical Report**

Report Date: 14 Dec-10 15:21 (p 1 of 4)

Test Code: 04-4111-9341/LP Control 1 vs

**Leptocheirus 28-d Survival, Growth and Reproduction Sediment Test****MACTEC Biology-Toxicology LAB**

<b>Analysis ID:</b> 01-0319-6428	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.7.0
<b>Analyzed:</b> 08 Dec-10 16:37	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes

<b>Batch ID:</b> 05-4826-7840	<b>Test Type:</b> Leptocheirus (28-d)	<b>Analyst:</b>
<b>Start Date:</b> 25 Aug-10	<b>Protocol:</b> EPA/600/R-01/020 (2001)	<b>Diluent:</b>
<b>Ending Date:</b> 25 Aug-10	<b>Species:</b> Leptocheirus plumulosus	<b>Brine:</b>
<b>Duration:</b> N/A	<b>Source:</b>	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Control1	05-2411-1861	24 Aug-10	24 Aug-10	24h		
Control2	04-7180-6200	24 Aug-10	24 Aug-10	24h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Control1	Sediment	Control 1			
Control2	Sediment	Control2			

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	0	C > T	Not Run					27.8%

**Equal Variance t Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
Control1		Control2	0.6393	1.86	0.1833	0.2703	Non-Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision
Extreme Value	Grubbs Single Outlier	1.56	2.29	1.0000	No Outliers Detected

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.009922496	0.009922496	1	0.4086	0.5405	Non-Significant Effect
Error	0.1942536	0.0242817	8			
Total	0.2041761	0.0342042	9			

**ANOVA Assumptions**

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	2.814	23.15	0.3403	Equal Variances
Distribution	Shapiro-Wilk Normality	0.8927		0.1820	Normal Distribution

**Mean Dry Biomass-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
Control1	5	0.6593	0.5873	0.7313	0.4535	0.8885	0.03515	0.1893	28.71%	0.0%
Control2	5	0.5963	0.5534	0.6392	0.4095	0.6955	0.02095	0.1128	18.92%	9.56%

**CETIS Analytical Report**

**Report Date:** 14 Dec-10 15:21 (p 2 of 4)  
**Test Code:** 04-4111-9341/LP Control 1 vs

**Leptocheirus 28-d Survival, Growth and Reproduction Sediment Test****MACTEC Biology-Toxicology LAB**

**Analysis ID:** 01-0319-6428      **Endpoint:** Mean Dry Biomass-mg  
**Analyzed:** 08 Dec-10 16:37      **Analysis:** Parametric-Two Sample

**CETIS Version:** CETISv1.7.0  
**Official Results:** Yes

**Mean Dry Biomass-mg Detail****Sample Code**

Control1

Control2

**CETIS Analytical Report**

**Report Date:** 14 Dec-10 15:21 (p 3 of 4)  
**Test Code:** 04-4111-9341/LP Control 1 vs

Leptocheirus 28-d Survival, Growth and Reproduction Sediment Test						MACTEC Biology-Toxicology LAB				
<b>Analysis ID:</b> 08-6067-7144	<b>Endpoint:</b> Survival Rate				<b>CETIS Version:</b> CETISv1.7.0					
<b>Analyzed:</b> 08 Dec-10 16:37	<b>Analysis:</b> Parametric-Two Sample			<b>Official Results:</b> Yes						
<b>Batch ID:</b> 05-4826-7840	<b>Test Type:</b> Leptocheirus (28-d)			<b>Analyst:</b>						
<b>Start Date:</b> 25 Aug-10	<b>Protocol:</b> EPA/600/R-01/020 (2001)			<b>Diluent:</b>						
<b>Ending Date:</b> 25 Aug-10	<b>Species:</b> Leptocheirus plumulosus			<b>Brine:</b>						
<b>Duration:</b> N/A	<b>Source:</b>			<b>Age:</b>						
Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project				
Control1	05-2411-1861	24 Aug-10	24 Aug-10	24h						
Control2	04-7180-6200	24 Aug-10	24 Aug-10	24h						
Sample Code	Material Type	Sample Source		Station Location		Latitude	Longitude			
Control1	Sediment	Control 1								
Control2	Sediment	Control2								
Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD		
Angular (Corrected)	0	C > T	Not Run					18.82%		
Equal Variance t Two-Sample Test										
Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)			
Control1		Control2	0.2839	1.86	0.1976	0.3918	Non-Significant Effect			
Test Acceptability										
Attribute	Test Stat	TAC Limits	Overlap	Decision						
Control Resp	0.83	0.8 - NL	Yes	Result Within Limits						
Auxillary Tests										
Attribute	Test		Test Stat	Critical	P-Value	Decision				
Extreme Value	Grubbs Single Outlier		2.074	2.29	0.1685	No Outliers Detected				
ANOVA Table										
Source	Sum Squares		Mean Square	DF	F Stat	P-Value	Decision(5%)			
Between	0.002275846		0.002275846	1	0.08062	0.7837	Non-Significant Effect			
Error	0.2258348		0.02822935	8						
Total	0.2281106		0.0305052	9						
ANOVA Assumptions										
Attribute	Test		Test Stat	Critical	P-Value	Decision(1%)				
Variances	Variance Ratio F		1.681	23.15	0.6272	Equal Variances				
Distribution	Shapiro-Wilk Normality		0.9228		0.3807	Normal Distribution				
Survival Rate Summary										
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
Control1	5	0.83	0.7883	0.8717	0.65	0.95	0.02034	0.1095	13.2%	0.0%
Control2	5	0.8	0.7554	0.8446	0.7	1	0.02177	0.1173	14.66%	3.61%

**CETIS Analytical Report**

**Report Date:** 14 Dec-10 15:21 (p 4 of 4)  
**Test Code:** 04-4111-9341/LP Control 1 vs

**Leptocheirus 28-d Survival, Growth and Reproduction Sediment Test****MACTEC Biology-Toxicology LAB**

**Analysis ID:** 08-6067-7144  
**Analyzed:** 08 Dec-10 16:37

**Endpoint:** Survival Rate  
**Analysis:** Parametric-Two Sample

**CETIS Version:** CETISv1.7.0  
**Official Results:** Yes

**Survival Rate Detail****Sample Code**

Control1  
Control2

**CETIS Analytical Report**

Report Date: 14 Dec-10 15:26 (p 1 of 4)  
 Test Code: 16-0932-1424/LP Intercoastal

**Leptocheirus 28-d Survival, Growth and Reproduction Sediment Test MACTEC Biology-Toxicology LAB**

<b>Analysis ID:</b> 14-2698-4028	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.7.0
<b>Analyzed:</b> 14 Dec-10 15:25	<b>Analysis:</b> Parametric-All Pairwise	<b>Official Results:</b> Yes
<b>Batch ID:</b> 05-4826-7840	<b>Test Type:</b> Leptocheirus (28-d)	<b>Analyst:</b>
<b>Start Date:</b> 25 Aug-10	<b>Protocol:</b> EPA/600/R-01/020 (2001)	<b>Diluent:</b>
<b>Ending Date:</b> 25 Aug-10	<b>Species:</b> Leptocheirus plumulosus	<b>Brine:</b>
<b>Duration:</b> N/A	<b>Source:</b>	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
EI-06	16-6046-5661	24 Aug-10	25 Aug-10	24h		
EI-07	00-4671-6706	24 Aug-10	25 Aug-10	24h	Gulfco	Gulfco

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
EI-06	Marine Dredge Sample	EI-06	EI-06		
EI-07	Marine Dredge Sample	EI-07	EI-07		

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	0	D<>0	Not Run					102.4%

**Student-Newman-Keuls Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
EI-06		EI-07	0.9644	3.264	0.1946	0.5147	Non-Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision
Extreme Value	Grubbs Single Outlier	2.009	2.29	0.2256	No Outliers Detected

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.008265623	0.008265623	1	0.465	0.5145	Non-Significant Effect
Error	0.142203	0.01777537	8			
Total	0.1504686	0.02604099	9			

**ANOVA Assumptions**

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	2.425	23.15	0.4119	Equal Variances
Distribution	Shapiro-Wilk Normality	0.9034		0.2385	Normal Distribution

**Mean Dry Biomass-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
EI-06	5	0.19	0.1297	0.2503	0.077	0.4425	0.02946	0.1587	83.5%	0.0%
EI-07	5	0.2475	0.2087	0.2863	0.116	0.3905	0.01892	0.1019	41.16%	-30.26%

**CETIS Analytical Report**

**Report Date:** 14 Dec-10 15:26 (p 2 of 4)  
**Test Code:** 16-0932-1424/LP Intercoastal

**Leptocheirus 28-d Survival, Growth and Reproduction Sediment Test****MACTEC Biology-Toxicology LAB**

**Analysis ID:** 14-2698-4028      **Endpoint:** Mean Dry Biomass-mg  
**Analyzed:** 14 Dec-10 15:25      **Analysis:** Parametric-All Pairwise

**CETIS Version:** CETISv1.7.0  
**Official Results:** Yes

**Mean Dry Biomass-mg Detail**

<b>Sample Code</b>	<b>Rep 1</b>	<b>Rep 2</b>	<b>Rep 3</b>	<b>Rep 4</b>	<b>Rep 5</b>
EI-06	0.252	0.077	0.0865	0.4425	0.092
EI-07	0.116	0.3905	0.232	0.2075	0.2915

**CETIS Analytical Report**

**Report Date:** 14 Dec-10 15:26 (p 3 of 4)  
**Test Code:** 16-0932-1424/LP Intercoastal

Leptocheirus 28-d Survival, Growth and Reproduction Sediment Test						MACTEC Biology-Toxicology LAB						
<b>Analysis ID:</b> 15-2852-5785	<b>Endpoint:</b> Survival Rate				<b>CETIS Version:</b> CETISv1.7.0							
<b>Analyzed:</b> 14 Dec-10 15:25	<b>Analysis:</b> Parametric-All Pairwise				<b>Official Results:</b> Yes							
<b>Batch ID:</b> 05-4826-7840	<b>Test Type:</b> Leptocheirus (28-d)				<b>Analyst:</b>							
<b>Start Date:</b> 25 Aug-10	<b>Protocol:</b> EPA/600/R-01/020 (2001)				<b>Diluent:</b>							
<b>Ending Date:</b> 25 Aug-10	<b>Species:</b> Leptocheirus plumulosus				<b>Brine:</b>							
<b>Duration:</b> N/A	<b>Source:</b>				<b>Age:</b>							
Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	<b>Project</b>						
EI-06	16-6046-5661	24 Aug-10	25 Aug-10	24h	Gulfco							
EI-07	00-4671-6706	24 Aug-10	25 Aug-10	24h		Gulfco						
Sample Code	Material Type	Sample Source			Station Location	Latitude	Longitude					
EI-06	Marine Dredge Sample	EI-06			EI-06							
EI-07	Marine Dredge Sample	EI-07			EI-07							
Data Transform	Zeta	Alt Hyp	Monte Carlo		NOEL	LOEL	TOEL	TU	PMSD			
Angular (Corrected)	0	D<>0	Not Run						73.66%			
<b>Student-Newman-Keuls Test</b>												
Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	<b>Decision(5%)</b>					
EI-06		EI-07	2.237	3.264	0.3635	0.1525	Non-Significant Effect					
<b>Auxiliary Tests</b>												
Attribute	Test		Test Stat	Critical	P-Value	<b>Decision</b>						
Extreme Value	Grubbs Single Outlier		1.677	2.29	0.7315	No Outliers Detected						
<b>ANOVA Table</b>												
Source	Sum Squares		Mean Square	DF	F Stat	P-Value	<b>Decision(5%)</b>					
Between	0.1551762		0.1551762	1	2.503	0.1523	Non-Significant Effect					
Error	0.4960025		0.06200031	8								
Total	0.6511787		0.2171765	9								
<b>ANOVA Assumptions</b>												
Attribute	Test		Test Stat	Critical	P-Value	<b>Decision(1%)</b>						
Variances, Distribution	Variance Ratio F Shapiro-Wilk Normality		1.55 0.8983	23.15 0.2101	0.6816 0.2101	Equal Variances Normal Distribution						
<b>Survival Rate Summary</b>												
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%		
EI-06	5	0.42	0.3398	0.5002	0.25	0.75	0.03917	0.211	50.23%	0.0%		
EI-07	5	0.64	0.5514	0.7286	0.4	0.95	0.04325	0.2329	36.39%	-52.38%		
<b>Angular (Corrected) Transformed Summary</b>												
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%		
EI-06	5	0.7026	0.6187	0.7865	0.5236	1.047	0.04095	0.2205	31.39%	0.0%		
EI-07	5	0.9517	0.8473	1.056	0.6847	1.345	0.05098	0.2745	28.85%	-35.46%		

**CETIS Analytical Report**

Report Date: 14 Dec-10 15:26 (p 4 of 4)  
Test Code: 16-0932-1424/LP Intercoastal

**Leptocheirus 28-d Survival, Growth and Reproduction Sediment Test****MACTEC Biology-Toxicology LAB**

Analysis ID: 15-2852-5785 Endpoint: Survival Rate  
Analyzed: 14 Dec-10 15:25 Analysis: Parametric-All Pairwise

CETIS Version: CETISv1.7.0  
Official Results: Yes

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
EI-06	0.5	0.25	0.35	0.75	0.25
EI-07	0.45	0.95	0.6	0.4	0.8

**CETIS Analytical Report**

**Report Date:** 14 Dec-10 15:28 (p 1 of 4)  
**Test Code:** 01-4794-0881/EI-Ref-LP

**Leptocheirus 28-d Survival, Growth and Reproduction Sediment Test****MACTEC Biology-Toxicology LAB**

<b>Analysis ID:</b> 01-4702-3413	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.7.0
<b>Analyzed:</b> 14 Dec-10 15:27	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 05-4826-7840	<b>Test Type:</b> Leptocheirus (28-d)	<b>Analyst:</b>
<b>Start Date:</b> 25 Aug-10	<b>Protocol:</b> EPA/600/R-01/020 (2001)	<b>Diluent:</b>
<b>Ending Date:</b> 25 Aug-10	<b>Species:</b> Leptocheirus plumulosus	<b>Brine:</b>
<b>Duration:</b> N/A	<b>Source:</b>	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Reference	00-2325-8351	24 Aug-10	24 Aug-10	24h	Gulfco	Gulfco
EI-01	16-0464-8606	24 Aug-10	24 Aug-10	24h		
EI-02	17-4690-1495	24 Aug-10	25 Aug-10	24h		
EI-03	10-0714-3044	24 Aug-10	25 Aug-10	24h		
EI-04	03-4097-7007	24 Aug-10	25 Aug-10	24h		
EI-05	04-5364-9674	24 Aug-10	25 Aug-10	24h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Reference	Reference sediment	Intercoastal Reference			
EI-01	Marine Dredge Sample	EI-01	EI-01		
EI-02	Marine Dredge Sample	EI-02	EI-02		
EI-03	Marine Dredge Sample	EI-03	EI-03		
EI-04	Marine Dredge Sample	EI-04	EI-04		
EI-05	Marine Dredge Sample	EI-05	EI-05		

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	0	C > T	Not Run					56.68%

**Equal Variance t Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
Reference		EI-01	-0.06297	1.771	0.1167	0.5246	Non-Significant Effect
		EI-02	-1.729	1.771	0.1306	0.9463	Non-Significant Effect
		EI-03	-0.2153	1.771	0.1501	0.5836	Non-Significant Effect
		EI-04	0.1329	1.771	0.1273	0.4482	Non-Significant Effect
		EI-05	-0.3935	1.771	0.124	0.6498	Non-Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision
Extreme Value	Grubbs Single Outlier	2.568	2.978	0.2491	No Outliers Detected

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.06719945	0.01343989	5	0.6839	0.6393	Non-Significant Effect
Error	0.5698947	0.01965154	29			
Total	0.6370941	0.03309143	34			

**ANOVA Assumptions**

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Bartlett Equality of Variance	2.221	15.09	0.8179	Equal Variances
Distribution	Shapiro-Wilk Normality	0.9703		0.4513	Normal Distribution

**CETIS Analytical Report**

Report Date: 14 Dec-10 15:28 (p 2 of 4)  
Test Code: 01-4794-0881/EI-Ref-LP

**Leptocheirus 28-d Survival, Growth and Reproduction Sediment Test****MACTEC Biology-Toxicology LAB**

Analysis ID: 01-4702-3413      Endpoint: Mean Dry Biomass-mg  
Analyzed: 14 Dec-10 15:27      Analysis: Parametric-Two Sample

CETIS Version: CETISv1.7.0  
Official Results: Yes

**Mean Dry Biomass-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
Reference	10	0.2187	0.1696	0.2679	0.077	0.4425	0.02401	0.1293	59.11%	0.0%
EI-01	5	0.2229	0.1859	0.2599	0.086	0.3115	0.01805	0.09718	43.6%	-1.9%
EI-02	5	0.3463	0.2907	0.4019	0.161	0.569	0.02712	0.1461	42.18%	-58.31%
EI-03	5	0.237	0.1607	0.3133	0.0345	0.5695	0.03725	0.2006	84.64%	-8.34%
EI-04	5	0.2092	0.1577	0.2607	0.078	0.3655	0.02515	0.1355	64.75%	4.37%
EI-05	5	0.2463	0.199	0.2936	0.044	0.3575	0.02311	0.1245	50.53%	-12.59%

**Mean Dry Biomass-mg Detail****Sample Code**

Reference  
EI-01  
EI-02  
EI-03  
EI-04  
EI-05

**CETIS Analytical Report**

**Report Date:** 14 Dec-10 15:28 (p 3 of 4)  
**Test Code:** 01-4794-0881/EI-Ref-LP

Leptocheirus 28-d Survival, Growth and Reproduction Sediment Test						MACTEC Biology-Toxicology LAB		
<b>Analysis ID:</b> 12-3088-4049	<b>Endpoint:</b> Survival Rate				<b>CETIS Version:</b> CETISv1.7.0			
<b>Analyzed:</b> 14 Dec-10 15:27	<b>Analysis:</b> Parametric-Two Sample				<b>Official Results:</b> Yes			
<b>Batch ID:</b> 05-4826-7840	<b>Test Type:</b> Leptocheirus (28-d)				<b>Analyst:</b>			
<b>Start Date:</b> 25 Aug-10	<b>Protocol:</b> EPA/600/R-01/020 (2001)				<b>Diluent:</b>			
<b>Ending Date:</b> 25 Aug-10	<b>Species:</b> Leptocheirus plumulosus				<b>Brine:</b>			
<b>Duration:</b> N/A	<b>Source:</b>				<b>Age:</b>			
Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project		
Reference	00-2325-8351	24 Aug-10	24 Aug-10	24h	Gulfco	Gulfco		
EI-01	16-0464-8606	24 Aug-10	24 Aug-10	24h				
EI-02	17-4690-1495	24 Aug-10	25 Aug-10	24h				
EI-03	10-0714-3044	24 Aug-10	25 Aug-10	24h				
EI-04	03-4097-7007	24 Aug-10	25 Aug-10	24h				
EI-05	04-5364-9674	24 Aug-10	25 Aug-10	24h				
Sample Code	Material Type	Sample Source		Station Location		Latitude	Longitude	
Reference	Reference sediment	Intercoastal Reference						
EI-01	Marine Dredge Sample	EI-01		EI-01				
EI-02	Marine Dredge Sample	EI-02		EI-02				
EI-03	Marine Dredge Sample	EI-03		EI-03				
EI-04	Marine Dredge Sample	EI-04		EI-04				
EI-05	Marine Dredge Sample	EI-05		EI-05				
Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	0	C > T	Not Run					43.61%
Equal Variance t Two-Sample Test								
Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)	
Reference		EI-01	1.042	1.771	0.2295	0.1582	Non-Significant Effect	
		EI-02	-0.8441	1.771	0.254	0.7931	Non-Significant Effect	
		EI-03	1.078	1.771	0.2669	0.1503	Non-Significant Effect	
		EI-04	0.859	1.771	0.2505	0.2030	Non-Significant Effect	
		EI-05	0.814	1.771	0.2487	0.2152	Non-Significant Effect	
Test Acceptability								
Attribute	Test Stat	TAC Limits	Overlap	Decision				
Control Resp	0.53	0.8 - NL	Yes	Result Below Limit				
Auxiliary Tests								
Attribute	Test		Test Stat	Critical	P-Value	Decision		
Extreme Value	Grubbs Single Outlier		2.304	2.978	0.5958	No Outliers Detected		
ANOVA Table								
Source	Sum Squares		Mean Square		DF	F Stat	P-Value	Decision(5%)
Between	0.3141387		0.06282774		5	1.059	0.4029	Non-Significant Effect
Error	1.720218		0.05931788		29			
Total	2.034357		0.1221456		34			
ANOVA Assumptions								
Attribute	Test		Test Stat	Critical	P-Value	Decision(1%)		
Variances	Bartlett Equality of Variance		2.138	15.09	0.8298	Equal Variances		
Distribution	Shapiro-Wilk Normality		0.9637		0.2938	Normal Distribution		

**CETIS Analytical Report**Report Date: 14 Dec-10 15:28 (p 4 of 4)  
Test Code: 01-4794-0881/EI-Ref-LP**Leptocheirus 28-d Survival, Growth and Reproduction Sediment Test****MACTEC Biology-Toxicology LAB****Analysis ID:** 12-3088-4049    **Endpoint:** Survival Rate  
**Analyzed:** 14 Dec-10 15:27    **Analysis:** Parametric-Two Sample**CETIS Version:** CETISv1.7.0  
**Official Results:** Yes**Survival Rate Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
Reference	10	0.53	0.4389	0.6211	0.25	0.95	0.04446	0.2394	45.18%	0.0%
EI-01	5	0.41	0.359	0.461	0.25	0.55	0.02491	0.1342	32.72%	22.64%
EI-02	5	0.64	0.5635	0.7165	0.4	0.95	0.03737	0.2012	31.44%	-20.75%
EI-03	5	0.39	0.2908	0.4892	0.1	0.8	0.04842	0.2608	66.86%	26.42%
EI-04	5	0.42	0.3364	0.5036	0.25	0.8	0.04079	0.2197	52.3%	20.75%
EI-05	5	0.44	0.3646	0.5154	0.1	0.6	0.03679	0.1981	45.03%	16.98%

**Survival Rate Detail****Sample Code**

Reference  
EI-01  
EI-02  
EI-03  
EI-04  
EI-05

**CETIS Analytical Report**

**Report Date:** 15 Dec-10 10:30 (p 1 of 4)  
**Test Code:** 06-4346-2203/LP Wet Ref Comp

**Leptocheirus 28-d Survival, Growth and Reproduction Sediment Test****MACTEC Biology-Toxicology LAB**

**Analysis ID:** 05-7169-1278    **Endpoint:** Mean Dry Biomass-mg  
**Analyzed:** 15 Dec-10 10:29    **Analysis:** Parametric-All Pairwise

**CETIS Version:** CETISv1.7.0  
**Official Results:** Yes

**Batch ID:** 05-4826-7840    **Test Type:** Leptocheirus (28-d)  
**Start Date:** 25 Aug-10    **Protocol:** EPA/600/R-01/020 (2001)  
**Ending Date:** 25 Aug-10    **Species:** Leptocheirus plumulosus  
**Duration:** N/A    **Source:**

**Analyst:**  
**Diluent:**  
**Brine:**  
**Age:**

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
W-08	12-9420-1377	24 Aug-10	25 Aug-10	24h	Gulfco	Gulfco
W-09	16-0157-7098	24 Aug-10	25 Aug-10	24h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
W-08	Sediment	W-08	W-08		
W-09	Sediment	W-09	W-09		

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	0	D<>0	Not Run					87.48%

**Student-Newman-Keuls Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
W-08		W-09	1.794	3.264	0.1958	0.2404	Non-Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision
Extreme Value	Grubbs Single Outlier	1.687	2.29	0.7097	No Outliers Detected

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.02894441	0.02894441	1	1.609	0.2403	Non-Significant Effect
Error	0.1439121	0.01798901	8			
Total	0.1728565	0.04693342	9			

**ANOVA Assumptions**

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.683	23.15	0.6263	Equal Variances
Distribution	Shapiro-Wilk Normality	0.9663		0.8541	Normal Distribution

**Mean Dry Biomass-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
W-08	5	0.2238	0.1667	0.2809	0.0105	0.4155	0.0279	0.1502	67.13%	0.0%
W-09	5	0.1162	0.07215	0.1602	0.018	0.266	0.0215	0.1158	99.65%	48.08%

**CETIS Analytical Report**

**Report Date:** 15 Dec-10 10:30 (p 2 of 4)  
**Test Code:** 06-4346-2203/LP Wet Ref Comp

**Leptocheirus 28-d Survival, Growth and Reproduction Sediment Test****MACTEC Biology-Toxicology LAB**

**Analysis ID:** 05-7169-1278      **Endpoint:** Mean Dry Biomass-mg  
**Analyzed:** 15 Dec-10 10:29      **Analysis:** Parametric-All Pairwise

**CETIS Version:** CETISv1.7.0  
**Official Results:** Yes

**Mean Dry Biomass-mg Detail****Sample Code**

W-08

W-09

**CETIS Analytical Report**

**Report Date:** 15 Dec-10 10:30 (p 3 of 4)  
**Test Code:** 06-4346-2203/LP Wet Ref Comp

**Leptocheirus 28-d Survival, Growth and Reproduction Sediment Test****MACTEC Biology-Toxicology LAB**

<b>Analysis ID:</b> 21-1363-0566	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.7.0
<b>Analyzed:</b> 15 Dec-10 10:29	<b>Analysis:</b> Parametric-All Pairwise	<b>Official Results:</b> Yes
<b>Batch ID:</b> 05-4826-7840	<b>Test Type:</b> Leptocheirus (28-d)	<b>Analyst:</b>
<b>Start Date:</b> 25 Aug-10	<b>Protocol:</b> EPA/600/R-01/020 (2001)	<b>Diluent:</b>
<b>Ending Date:</b> 25 Aug-10	<b>Species:</b> Leptocheirus plumulosus	<b>Brine:</b>
<b>Duration:</b> N/A	<b>Source:</b>	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
W-08	12-9420-1377	24 Aug-10	25 Aug-10	24h	Gulfco	Gulfco
W-09	16-0157-7098	24 Aug-10	25 Aug-10	24h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
W-08	Sediment	W-08	W-08		
W-09	Sediment	W-09	W-09		

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	0	D<>0	Not Run					70.95%

**Student-Newman-Keuls Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
W-08		W-09	1.867	3.264	0.2773	0.2235	Non-Significant Effect

**Test Acceptability**

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control Resp	0.33	0.8 - NL	Yes	Result Below Limit

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision
Extreme Value	Grubbs Single Outlier	2.047	2.29	0.1908	No Outliers Detected

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.06287524	0.06287524	1	1.742	0.2234	Non-Significant Effect
Error	0.288734	0.03609175	8			
Total	0.3516093	0.09896699	9			

**ANOVA Assumptions**

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.761	23.15	0.5972	Equal Variances
Distribution	Shapiro-Wilk Normality	0.9019		0.2297	Normal Distribution

**Survival Rate Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
W-08	5	0.33	0.2661	0.3939	0.05	0.45	0.03121	0.1681	50.93%	0.0%
W-09	5	0.19	0.1446	0.2354	0.05	0.35	0.02217	0.1194	62.83%	42.42%

**CETIS Analytical Report**

**Report Date:** 15 Dec-10 10:30 (p 4 of 4)  
**Test Code:** 06-4346-2203/LP Wet Ref Comp

**Leptocheirus 28-d Survival, Growth and Reproduction Sediment Test****MACTEC Biology-Toxicology LAB**

**Analysis ID:** 21-1363-0566      **Endpoint:** Survival Rate  
**Analyzed:** 15 Dec-10 10:29      **Analysis:** Parametric-All Pairwise

**CETIS Version:** CETISv1.7.0  
**Official Results:** Yes

**Survival Rate Detail****Sample Code**

W-08  
W-09

**CETIS Analytical Report**

**Report Date:** 15 Dec-10 10:28 (p 1 of 4)  
**Test Code:** 09-0065-4155/W-REF-LP

**Leptocheirus 28-d Survival, Growth and Reproduction Sediment Test****MACTEC Biology-Toxicology LAB**

<b>Analysis ID:</b> 18-8782-5239	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.7.0
<b>Analyzed:</b> 15 Dec-10 10:28	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 08-9796-1970	<b>Test Type:</b> Leptocheirus (28-d)	<b>Analyst:</b>
<b>Start Date:</b> 25 Aug-10	<b>Protocol:</b> EPA/600/R-01/020 (2001)	<b>Diluent:</b>
<b>Ending Date:</b> 22 Sep-10	<b>Species:</b> Leptocheirus plumulosus	<b>Brine:</b>
<b>Duration:</b> 28d 0h	<b>Source:</b>	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Reference	02-3633-2190	24 Aug-10	24 Aug-09	24h	Gulfco	Gulfco
W-01	01-5466-3613	24 Aug-10	25 Aug-10	24h		
W-02	08-5451-7873	24 Aug-10	25 Aug-10	24h		
W-03	06-9110-7113	24 Aug-10	25 Aug-10	24h		
W-04	14-7060-6066	24 Aug-10	25 Aug-10	24h		
W-05	15-8235-8061	24 Aug-10	25 Aug-10	24h		
W-06	16-3918-5222	24 Aug-10	25 Aug-10	24h		
W-07	21-0527-6980	24 Aug-10	25 Aug-10	24h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Reference	Reference sediment	Wetland Reference			
W-01	Sediment	W-01	W-01		
W-02	Sediment	W-02	W-02		
W-03	Sediment	W-03	W-03		
W-04	Sediment	W-04	W-04		
W-05	Sediment	W-05	W-05		
W-06	Sediment	W-06	W-06		
W-07	Sediment	W-07	W-07		

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	0	C > T	Not Run					74.17%

**Equal Variance t Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
Reference		W-01	-0.9082	1.771	0.1769	0.8099	Non-Significant Effect
		W-02	-0.9348	1.771	0.1161	0.8165	Non-Significant Effect
		W-03	1.229	1.771	0.1288	0.1205	Non-Significant Effect
		W-04	0.701	1.782	0.1427	0.2483	Non-Significant Effect
		W-05	0.1282	1.771	0.1188	0.4500	Non-Significant Effect
		W-06	1.937	1.771	0.115	0.0374	Significant Effect
		W-07	0.6461	1.771	0.1261	0.2647	Non-Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision
Extreme Value	Grubbs Single Outlier	2.961	3.076	0.0806	No Outliers Detected

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.1875203	0.02678861	7	1.536	0.1867	Non-Significant Effect
Error	0.6279879	0.01744411	36			
Total	0.8155082	0.04423272	43			

**ANOVA Assumptions**

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Bartlett Equality of Variance	14.3	18.48	0.0461	Equal Variances
Distribution	Shapiro-Wilk Normality	0.963		0.1678	Normal Distribution

**CETIS Analytical Report**

**Report Date:** 15 Dec-10 10:28 (p 2 of 4)  
**Test Code:** 09-0065-4155/W-REF-LP

**Leptocheirus 28-d Survival, Growth and Reproduction Sediment Test****MACTEC Biology-Toxicology LAB**

**Analysis ID:** 18-8782-5239    **Endpoint:** Mean Dry Biomass-mg  
**Analyzed:** 15 Dec-10 10:28    **Analysis:** Parametric-Two Sample

**CETIS Version:** CETISv1.7.0  
**Official Results:** Yes

**Mean Dry Biomass-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
Reference	10	0.17	0.1173	0.2227	0.0105	0.4155	0.02573	0.1386	81.52%	0.0%
W-01	5	0.2607	0.1639	0.3575	0.059	0.6185	0.04728	0.2546	97.66%	-53.35%
W-02	5	0.2313	0.2092	0.2534	0.147	0.278	0.01079	0.05809	25.12%	-36.06%
W-03	5	0.0806	0.03538	0.1258	0	0.264	0.02208	0.1189	147.5%	52.59%
W-04	4	0.1139	0.06632	0.1614	0	0.2905	0.02322	0.125	109.8%	33.01%
W-05	5	0.1614	0.1331	0.1897	0.097	0.2455	0.01382	0.0744	46.1%	5.06%
W-06	5	0.0442	0.02523	0.06317	0	0.128	0.009259	0.04986	112.8%	74.0%
W-07	5	0.124	0.08284	0.1652	0.0185	0.271	0.02009	0.1082	87.25%	27.06%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Reference	0.248	0.0105	0.1615	0.4155	0.2835	0.0565	0.0255	0.215	0.018	0.266
W-01	0.0985	0.059	0.0845	0.6185	0.443					
W-02	0.266	0.278	0.2715	0.194	0.147					
W-03	0	0.264	0.139	0	0					
W-04	0.102	0	0.063	0.2905						
W-05	0.108	0.097	0.117	0.2455	0.2395					
W-06	0	0.128	0.02	0.025	0.048					
W-07	0.271	0.205	0.0185	0.0595	0.066					

**CETIS Analytical Report**

**Report Date:** 15 Dec-10 10:28 (p 3 of 4)  
**Test Code:** 09-0065-4155/W-REF-LP

**Leptocheirus 28-d Survival, Growth and Reproduction Sediment Test****MACTEC Biology-Toxicology LAB**

<b>Analysis ID:</b> 16-5041-0885	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.7.0
<b>Analyzed:</b> 15 Dec-10 10:28	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 08-9796-1970	<b>Test Type:</b> Leptocheirus (28-d)	<b>Analyst:</b>
<b>Start Date:</b> 25 Aug-10	<b>Protocol:</b> EPA/600/R-01/020 (2001)	<b>Diluent:</b>
<b>Ending Date:</b> 22 Sep-10	<b>Species:</b> Leptocheirus plumulosus	<b>Brine:</b>
<b>Duration:</b> 28d 0h	<b>Source:</b>	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Reference	02-3633-2190	24 Aug-10	24 Aug-09	24h	Gulfco	Gulfco
W-01	01-5466-3613	24 Aug-10	25 Aug-10	24h		
W-02	08-5451-7873	24 Aug-10	25 Aug-10	24h		
W-03	06-9110-7113	24 Aug-10	25 Aug-10	24h		
W-04	14-7060-6066	24 Aug-10	25 Aug-10	24h		
W-05	15-8235-8061	24 Aug-10	25 Aug-10	24h		
W-06	16-3918-5222	24 Aug-10	25 Aug-10	24h		
W-07	21-0527-6980	24 Aug-10	25 Aug-10	24h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Reference	Reference sediment	Wetland Reference			
W-01	Sediment	W-01	W-01		
W-02	Sediment	W-02	W-02		
W-03	Sediment	W-03	W-03		
W-04	Sediment	W-04	W-04		
W-05	Sediment	W-05	W-05		
W-06	Sediment	W-06	W-06		
W-07	Sediment	W-07	W-07		

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	0	C > T	Not Run					67.31%

**Equal Variance t Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
Reference		W-01	-0.986	1.771	0.1928	0.8289	Non-Significant Effect
		W-02	-2.809	1.771	0.2225	0.9926	Non-Significant Effect
		W-03	0.8738	1.771	0.2664	0.1991	Non-Significant Effect
		W-04	0.3727	1.782	0.2583	0.3579	Non-Significant Effect
		W-05	-1.538	1.771	0.1717	0.9260	Non-Significant Effect
		W-06	1.634	1.771	0.196	0.0631	Non-Significant Effect
		W-07	-0.3163	1.771	0.217	0.6216	Non-Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision
Extreme Value	Grubbs Single Outlier	2.593	3.076	0.3137	No Outliers Detected

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	1.011995	0.1445707	7	2.189	0.0585	Non-Significant Effect
Error	2.37721	0.06603362	36			
Total	3.389205	0.2106044	43			

**ANOVA Assumptions**

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Bartlett Equality of Variance	7.058	18.48	0.4229	Equal Variances
Distribution	Shapiro-Wilk Normality	0.9758		0.4748	Normal Distribution

**CETIS Analytical Report**

Report Date: 15 Dec-10 10:28 (p 4 of 4)  
 Test Code: 09-0065-4155/W-REF-LP

**Leptocheirus 28-d Survival, Growth and Reproduction Sediment Test****MACTEC Biology-Toxicology LAB**

**Analysis ID:** 16-5041-0885    **Endpoint:** Survival Rate  
**Analyzed:** 15 Dec-10 10:28    **Analysis:** Parametric-Two Sample

**CETIS Version:** CETISv1.7.0  
**Official Results:** Yes

**Survival Rate Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
Reference	10	0.26	0.2007	0.3193	0.05	0.45	0.02897	0.156	60.0%	0.0%
W-01	5	0.35	0.2828	0.4172	0.1	0.55	0.03283	0.1768	50.51%	-34.62%
W-02	5	0.58	0.4788	0.6812	0.15	0.8	0.04939	0.266	45.86%	-123.1%
W-03	5	0.2	0.08276	0.3172	0	0.7	0.05724	0.3082	154.1%	23.08%
W-04	4	0.2375	0.1284	0.3466	0	0.65	0.05327	0.2869	120.8%	8.65%
W-05	5	0.38	0.3362	0.4238	0.3	0.55	0.02138	0.1151	30.29%	-46.15%
W-06	5	0.13	0.07521	0.1848	0	0.35	0.02675	0.144	110.8%	50.0%
W-07	5	0.3	0.2108	0.3892	0.05	0.55	0.04355	0.2345	78.17%	-15.38%

**Angular (Corrected) Transformed Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
Reference	10	0.5128	0.4376	0.588	0.2255	0.7353	0.0367	0.1977	38.54%	0.0%
W-01	5	0.6202	0.5436	0.6968	0.3218	0.8355	0.03739	0.2013	32.47%	-20.94%
W-02	5	0.8657	0.7561	0.9754	0.3977	1.107	0.05353	0.2883	33.3%	-68.82%
W-03	5	0.3814	0.2306	0.5322	0.112	0.9912	0.07362	0.3965	104.0%	25.63%
W-04	4	0.4588	0.3255	0.5921	0.112	0.9377	0.06508	0.3504	76.38%	10.53%
W-05	5	0.6619	0.617	0.7069	0.5796	0.8355	0.02194	0.1181	17.85%	-29.08%
W-06	5	0.332	0.2515	0.4124	0.112	0.6331	0.03929	0.2116	63.73%	35.27%
W-07	5	0.5516	0.4476	0.6556	0.2255	0.8355	0.05076	0.2734	49.56%	-7.56%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Reference	0.3	0.05	0.4	0.45	0.45	0.2	0.1	0.25	0.05	0.35
W-01	0.4	0.1	0.25	0.55	0.45					
W-02	0.7	0.75	0.8	0.5	0.15					
W-03	0	0.7	0.3	0	0					
W-04	0.2	0	0.1	0.65						
W-05	0.3	0.3	0.3	0.45	0.55					
W-06	0	0.35	0.05	0.05	0.2					
W-07	0.55	0.55	0.05	0.15	0.2					

**CETIS Analytical Report**

**Report Date:** 15 Dec-10 10:46 (p 1 of 4)  
**Test Code:** 18-9787-2318/NA Control1 vs

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

<b>Analysis ID:</b> 20-6253-3844	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.7.0						
<b>Analyzed:</b> 08 Dec-10 16:36	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes						
<b>Batch ID:</b> 06-2679-7824	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b>						
<b>Start Date:</b> 25 Aug-10	<b>Protocol:</b> ASTM-E1611-00 (2000)	<b>Diluent:</b>						
<b>Ending Date:</b> 22 Sep-10	<b>Species:</b> Neanthes arenaceodentata	<b>Brine:</b>						
<b>Duration:</b> 28d 0h	<b>Source:</b>	<b>Age:</b>						
Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project		
Control1	05-2411-1861	24 Aug-10	24 Aug-10	24h				
Control2	04-7180-6200	24 Aug-10	24 Aug-10	24h				
Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude			
Control1	Sediment	Control 1						
Control2	Sediment	Control2						
Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	0	C > T	Not Run					10.75%

**Equal Variance t Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
Control1		Control2	1.633	1.86	0.1085	0.0706	Non-Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision
Extreme Value	Grubbs Single Outlier	1.643	2.29	0.8052	No Outliers Detected

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.02268316	0.02268316	1	2.667	0.1411	Non-Significant Effect
Error	0.06804948	0.008506184	8			
Total	0.09073263	0.03118934	9			

**ANOVA Assumptions**

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Mod Levene Equality of Variance	3	13.75	0.1340	Equal Variances
Distribution	Shapiro-Wilk Normality	0.8142		0.0215	Normal Distribution

**Survival Rate Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
Control1	5	1	1	1	1	1	0	0	0.0%	0.0%
Control2	5	0.92	0.8783	0.9617	0.8	1	0.02034	0.1095	11.91%	8.0%

**CETIS Analytical Report**

**Report Date:** 15 Dec-10 10:46 (p 2 of 4)  
**Test Code:** 18-9787-2318/NA Control1 vs

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

**Analysis ID:** 20-6253-3844      **Endpoint:** Survival Rate  
**Analyzed:** 08 Dec-10 16:36      **Analysis:** Parametric-Two Sample

**CETIS Version:** CETISv1.7.0  
**Official Results:** Yes

**Survival Rate Detail****Sample Code**

Control1  
Control2

**CETIS Analytical Report**

**Report Date:** 15 Dec-10 10:46 (p 3 of 4)  
**Test Code:** 18-9787-2318/NA Control1 vs

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

<b>Analysis ID:</b> 03-3034-8010	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.7.0						
<b>Analyzed:</b> 08 Dec-10 16:35	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes						
<b>Batch ID:</b> 06-2679-7824	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b>						
<b>Start Date:</b> 25 Aug-10	<b>Protocol:</b> ASTM E1611-00 (2000)	<b>Diluent:</b>						
<b>Ending Date:</b> 22 Sep-10	<b>Species:</b> Neanthes arenaceodentata	<b>Brine:</b>						
<b>Duration:</b> 28d 0h	<b>Source:</b>	<b>Age:</b>						
Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project		
Control1	05-2411-1861	24 Aug-10	24 Aug-10	24h				
Control2	04-7180-6200	24 Aug-10	24 Aug-10	24h				
Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude			
Control1	Sediment	Control 1						
Control2	Sediment	Control2						
Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	0	C > T	Not Run					21.76%

**Equal Variance t Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
Control1		Control2	0.1589	1.86	0.8943	0.4389	Non-Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision
Extreme Value	Grubbs Single Outlier	1.493	2.29	1.0000	No Outliers Detected

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.01459245	0.01459245	1	0.02523	0.8777	Non-Significant Effect
Error	4.626101	0.5782627	8			
Total	4.640694	0.5928552	9			

**ANOVA Assumptions**

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	2.879	23.15	0.3302	Equal Variances
Distribution	Shapiro-Wilk Normality	0.9317		0.4645	Normal Distribution

**Mean Dry Biomass-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
Control1	5	4.111	3.903	4.318	3.614	5.04	0.1014	0.546	13.28%	0.0%
Control2	5	4.034	3.682	4.387	2.964	4.846	0.172	0.9265	22.97%	1.86%

**CETIS Analytical Report**

**Report Date:** 15 Dec-10 10:46 (p 4 of 4)  
**Test Code:** 18-9787-2318/NA Control1 vs

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

**Analysis ID:** 03-3034-8010      **Endpoint:** Mean Dry Biomass-mg  
**Analyzed:** 08 Dec-10 16:35      **Analysis:** Parametric-Two Sample

**CETIS Version:** CETISv1.7.0  
**Official Results:** Yes

**Mean Dry Biomass-mg Detail****Sample Code**

Control1  
Control2

**CETIS Analytical Report**

Report Date: 15 Dec-10 10:35 (p 1 of 4)

Test Code: 11-8377-3806/NA Intercoastal

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

<b>Analysis ID:</b> 03-4786-6719	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.7.0						
<b>Analyzed:</b> 15 Dec-10 10:34	<b>Analysis:</b> Parametric-All Pairwise	<b>Official Results:</b> Yes						
<b>Batch ID:</b> 06-2679-7824	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b>						
<b>Start Date:</b> 25 Aug-10	<b>Protocol:</b> ASTM E1611-00 (2000)	<b>Diluent:</b>						
<b>Ending Date:</b> 22 Sep-10	<b>Species:</b> Neanthes arenaceodentata	<b>Brine:</b>						
<b>Duration:</b> 28d 0h	<b>Source:</b>	<b>Age:</b>						
Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project		
EI-06	16-6046-5661	24 Aug-10	25 Aug-10	24h				
EI-07	00-4671-6706	24 Aug-10	25 Aug-10	24h	Gulfco	Gulfco		
Sample Code	Material Type	Sample Source		Station Location	Latitude	Longitude		
EI-06	Marine Dredge Sample	EI-06		EI-06				
EI-07	Marine Dredge Sample	EI-07		EI-07				
Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	0	D<>0	Not Run					12.42%

**Student-Newman-Keuls Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
EI-06		EI-07	2.309	3.264	0.1346	0.1413	Non-Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision
Extreme Value	Grubbs Single Outlier	1.643	2.29	0.8052	No Outliers Detected

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.02268316	0.02268316	1	2.667	0.1411	Non-Significant Effect
Error	0.06804948	0.008506184	8			
Total	0.09073263	0.03118934	9			

**ANOVA Assumptions**

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Mod Levene Equality of Variance	3	13.75	0.1340	Equal Variances
Distribution	Shapiro-Wilk Normality	0.8142		0.0215	Normal Distribution

**Survival Rate Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
EI-06	5	1	1	1	1	1	0	0	0.0%	0.0%
EI-07	5	0.92	0.8783	0.9617	0.8	1	0.02034	0.1095	11.91%	8.0%

**Angular (Corrected) Transformed Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
EI-06	5	1.345	1.345	1.345	1.345	1.345	0	0	0.0%	0.0%
EI-07	5	1.25	1.2	1.3	1.107	1.345	0.02422	0.1304	10.43%	7.08%

**CETIS Analytical Report**

Report Date: 15 Dec-10 10:35 (p 2 of 4)  
Test Code: 11-8377-3806/NA Intercoastal

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

Analysis ID: 03-4786-6719      Endpoint: Survival Rate  
Analyzed: 15 Dec-10 10:34      Analysis: Parametric-All Pairwise

CETIS Version: CETISv1.7.0  
Official Results: Yes

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
EI-06	1	1	1	1	1
EI-07	1	1	0.8	1	0.8

**CETIS Analytical Report**

Report Date: 15 Dec-10 10:35 (p 3 of 4)  
 Test Code: 11-8377-3806/NA Intercoastal

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

<b>Analysis ID:</b> 12-8532-8050	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.7.0
<b>Analyzed:</b> 15 Dec-10 10:34	<b>Analysis:</b> Parametric-All Pairwise	<b>Official Results:</b> Yes

<b>Batch ID:</b> 06-2679-7824	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b>
<b>Start Date:</b> 25 Aug-10	<b>Protocol:</b> ASTM E1611-00 (2000)	<b>Diluent:</b>
<b>Ending Date:</b> 22 Sep-10	<b>Species:</b> Neanthes arenaceodentata	<b>Brine:</b>
<b>Duration:</b> 28d 0h	<b>Source:</b>	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
EI-06	16-6046-5661	24 Aug-10	25 Aug-10	24h		
EI-07	00-4671-6706	24 Aug-10	25 Aug-10	24h	Gulfco	Gulfco

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
EI-06	Marine Dredge Sample	EI-06	EI-06		
EI-07	Marine Dredge Sample	EI-07	EI-07		

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	0	D<>0	Not Run					34.17%

**Student-Newman-Keuls Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
EI-06		EI-07	0.115	3.264	1.635	0.9373	Non-Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision
Extreme Value	Grubbs Single Outlier	1.623	2.29	0.8514	No Outliers Detected

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.00829442	0.00829442	1	0.006613	0.9372	Non-Significant Effect
Error	10.03469	1.254336	8			
Total	10.04298	1.262631	9			

**ANOVA Assumptions**

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.055	23.15	0.9599	Equal Variances
Distribution	Shapiro-Wilk Normality	0.9338		0.4864	Normal Distribution

**Mean Dry Biomass-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
EI-06	5	4.784	4.352	5.216	3.43	6.498	0.2107	1.135	23.72%	0.0%
EI-07	5	4.842	4.421	5.262	3.474	6.384	0.2052	1.105	22.82%	-1.2%

**CETIS Analytical Report**

Report Date: 15 Dec-10 10:35 (p 4 of 4)

Test Code: 11-8377-3806/NA Intercoastal

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB****Analysis ID:** 12-8532-8050    **Endpoint:** Mean Dry Biomass-mg  
**Analyzed:** 15 Dec-10 10:34    **Analysis:** Parametric-All Pairwise**CETIS Version:** CETISv1.7.0  
**Official Results:** Yes**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
EI-06	5.03	4.742	4.22	3.43	6.498
EI-07	6.384	4.238	3.474	4.758	5.354

**CETIS Analytical Report**

**Report Date:** 15 Dec-10 10:37 (p 1 of 4)  
**Test Code:** 19-6549-3148/EL-Ref-NA

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

<b>Analysis ID:</b> 10-5594-1862	<b>Endpoint:</b> Mean Dry Weight-mg	<b>CETIS Version:</b> CETISv1.7.0
<b>Analyzed:</b> 15 Dec-10 10:37	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes

<b>Batch ID:</b> 06-2679-7824	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b>
<b>Start Date:</b> 25 Aug-10	<b>Protocol:</b> ASTM E1611-00 (2000)	<b>Diluent:</b>
<b>Ending Date:</b> 22 Sep-10	<b>Species:</b> Neanthes arenaceodentata	<b>Brine:</b>
<b>Duration:</b> 28d 0h	<b>Source:</b>	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Reference	00-2325-8351	24 Aug-10	24 Aug-10	24h	Gulfco	Gulfco
EI-01	16-0464-8606	24 Aug-10	24 Aug-10	24h		
EI-02	17-4690-1495	24 Aug-10	25 Aug-10	24h		
EI-03	10-0714-3044	24 Aug-10	25 Aug-10	24h		
EI-04	03-4097-7007	24 Aug-10	25 Aug-10	24h		
EI-05	04-5364-9674	24 Aug-10	25 Aug-10	24h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Reference	Reference sediment	Intercoastal Reference			
EI-01	Marine Dredge Sample	EI-01	EI-01		
EI-02	Marine Dredge Sample	EI-02	EI-02		
EI-03	Marine Dredge Sample	EI-03	EI-03		
EI-04	Marine Dredge Sample	EI-04	EI-04		
EI-05	Marine Dredge Sample	EI-05	EI-05		

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	0	C > T	Not Run					19.18%

**Unequal Variance t Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
Reference		EI-01	0.3037	1.86	1.08	0.3846	Non-Significant Effect
		EI-02	-1.19	2.132	2.831	0.8501	Non-Significant Effect
		EI-03	-0.9149	1.796	0.898	0.8101	Non-Significant Effect
		EI-04	-1.817	1.833	1.001	0.9487	Non-Significant Effect
		EI-05	1.717	1.812	0.9652	0.0584	Non-Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision
Extreme Value	Grubbs Single Outlier	3.855	2.978	0.0004	Outlier Detected

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	20.10712	4.021423	5	2.032	0.1036	Non-Significant Effect
Error	57.39983	1.979304	29			
Total	77.50694	6.000728	34			

**ANOVA Assumptions**

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Bartlett Equality of Variance	11.49	15.09	0.0424	Equal Variances
Distribution	Shapiro-Wilk Normality	0.8747		0.0009	Non-normal Distribution

**CETIS Analytical Report**

Report Date: 15 Dec-10 10:37 (p 2 of 4)  
Test Code: 19-6549-3148/EL-Ref-NA

**Neanthes Survival and Growth Test** **MACTEC Biology-Toxicology LAB**

Analysis ID: 10-5594-1862 Endpoint: Mean Dry Weight-mg  
Analyzed: 15 Dec-10 10:37 Analysis: Parametric-Two Sample

CETIS Version: CETISv1.7.0  
Official Results: Yes

**Mean Dry Weight-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
Reference	10	5.033	4.609	5.458	3.43	6.693	0.2074	1.117	22.19%	0.0%
EI-01	5	4.857	4.465	5.249	3.908	6.553	0.1915	1.031	21.23%	3.51%
EI-02	5	6.614	5.525	7.702	4.582	11.62	0.5315	2.862	43.27%	-31.4%
EI-03	5	5.491	5.19	5.792	4.7	6.718	0.147	0.7916	14.42%	-9.09%
EI-04	5	6.026	5.672	6.38	4.472	6.778	0.173	0.9318	15.46%	-19.72%
EI-05	5	4.119	3.78	4.458	3.018	5.416	0.1655	0.8913	21.64%	18.16%

**Mean Dry Weight-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Reference	5.03	4.742	4.22	3.43	6.498	6.384	4.238	4.343	4.758	6.693
EI-01	5.002	4.238	4.585	6.553	3.908					
EI-02	6.123	11.62	4.582	5.693	5.048					
EI-03	5.738	6.718	4.946	4.7	5.354					
EI-04	6.194	4.472	6.706	6.778	5.98					
EI-05	3.018	3.802	4.476	3.884	5.416					

**CETIS Analytical Report**

**Report Date:** 15 Dec-10 10:37 (p 3 of 4)  
**Test Code:** 19-6549-3148/EL-Ref-NA

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

<b>Analysis ID:</b> 11-1346-9279	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.7.0
<b>Analyzed:</b> 15 Dec-10 10:37	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 06-2679-7824	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b>
<b>Start Date:</b> 25 Aug-10	<b>Protocol:</b> ASTM E1611-00 (2000)	<b>Diluent:</b>
<b>Ending Date:</b> 22 Sep-10	<b>Species:</b> Neanthes arenaceodentata	<b>Brine:</b>
<b>Duration:</b> 28d 0h	<b>Source:</b>	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Reference	00-2325-8351	24 Aug-10	24 Aug-10	24h	Gulfco	Gulfco
EI-01	16-0464-8606	24 Aug-10	24 Aug-10	24h		
EI-02	17-4690-1495	24 Aug-10	25 Aug-10	24h		
EI-03	10-0714-3044	24 Aug-10	25 Aug-10	24h		
EI-04	03-4097-7007	24 Aug-10	25 Aug-10	24h		
EI-05	04-5364-9674	24 Aug-10	25 Aug-10	24h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Reference	Reference sediment	Intercoastal Reference			
EI-01	Marine Dredge Sample	EI-01	EI-01		
EI-02	Marine Dredge Sample	EI-02	EI-02		
EI-03	Marine Dredge Sample	EI-03	EI-03		
EI-04	Marine Dredge Sample	EI-04	EI-04		
EI-05	Marine Dredge Sample	EI-05	EI-05		

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	0	C > T	Not Run					20.32%

**Equal Variance t Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
Reference		EI-01	0.765	1.771	0.9287	0.2290	Non-Significant Effect
		EI-02	-0.2757	1.771	1.097	0.6064	Non-Significant Effect
		EI-03	-0.3645	1.771	0.8746	0.6393	Non-Significant Effect
		EI-04	-2.172	1.771	0.989	0.9755	Non-Significant Effect
		EI-05	1.256	1.771	0.9782	0.1157	Non-Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision
Extreme Value	Grubbs Single Outlier	2.29	2.978	0.6212	No Outliers Detected

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	10.7201	2.14402	5	2.421	0.0596	Non-Significant Effect
Error	25.68631	0.8857348	29			
Total	36.40641	3.029755	34			

**ANOVA Assumptions**

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Bartlett Equality of Variance	5.63	15.09	0.3439	Equal Variances
Distribution	Shapiro-Wilk Normality	0.972		0.4997	Normal Distribution

**CETIS Analytical Report**

Report Date: 15 Dec-10 10:37 (p 4 of 4)

Test Code: 19-6549-3148/EL-Ref-NA

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

Analysis ID:	11-1346-9279	Endpoint:	Mean Dry Biomass-mg	CETIS Version:	CETISv1.7.0
Analyzed:	15 Dec-10 10:37	Analysis:	Parametric-Two Sample	Official Results:	Yes

**Mean Dry Biomass-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
Reference	10	4.813	4.411	5.215	3.43	6.498	0.1962	1.056	21.95%	0.0%
EI-01	5	4.412	4.151	4.672	3.668	5.242	0.1271	0.6846	15.52%	8.34%
EI-02	5	4.984	4.495	5.472	3.416	6.974	0.2384	1.284	25.76%	-3.55%
EI-03	5	4.993	4.855	5.131	4.59	5.374	0.06734	0.3626	7.26%	-3.74%
EI-04	5	6.026	5.672	6.38	4.472	6.778	0.173	0.9318	15.46%	-25.21%
EI-05	5	4.119	3.78	4.458	3.018	5.416	0.1655	0.8913	21.64%	14.41%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Reference	5.03	4.742	4.22	3.43	6.498	6.384	4.238	3.474	4.758	5.354
EI-01	5.002	4.238	3.668	5.242	3.908					
EI-02	4.898	6.974	4.582	3.416	5.048					
EI-03	4.59	5.374	4.946	4.7	5.354					
EI-04	6.194	4.472	6.706	6.778	5.98					
EI-05	3.018	3.802	4.476	3.884	5.416					

**CETIS Analytical Report**

**Report Date:** 15 Dec-10 10:43 (p 1 of 4)  
**Test Code:** 01-7105-4561/AN WET Ref Comp

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

<b>Analysis ID:</b> 02-7121-2327	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.7.0						
<b>Analyzed:</b> 15 Dec-10 10:43	<b>Analysis:</b> Parametric-All Pairwise	<b>Official Results:</b> Yes						
<b>Batch ID:</b> 06-2679-7824	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b>						
<b>Start Date:</b> 25 Aug-10	<b>Protocol:</b> ASTM E1611-00 (2000)	<b>Diluent:</b>						
<b>Ending Date:</b> 22 Sep-10	<b>Species:</b> Neanthes arenaceodentata	<b>Brine:</b>						
<b>Duration:</b> 28d 0h	<b>Source:</b>	<b>Age:</b>						
Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project		
W-08	12-9420-1377	24 Aug-10	25 Aug-10	24h	Gulfco	Gulfco		
W-09	16-0157-7098	24 Aug-10	25 Aug-10	24h				
Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude			
W-08	Sediment	W-08	W-08					
W-09	Sediment	W-09	W-09					
Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	0	D<>0	Not Run					54.98%

**Student-Newman-Keuls Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
W-08		W-09	0.6972	3.264	0.3955	0.6354	Non-Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision
Extreme Value	Grubbs Single Outlier	2.029	2.29	0.2069	No Outliers Detected

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.01784467	0.01784467	1	0.2431	0.6352	Non-Significant Effect
Error	0.5873185	0.07341481	8			
Total	0.6051632	0.09125948	9			

**ANOVA Assumptions**

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	3.019	23.15	0.3098	Equal Variances
Distribution	Shapiro-Wilk Normality	0.9565		0.7454	Normal Distribution

**Survival Rate Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
W-08	5	0.68	0.5646	0.7954	0.2	1	0.05632	0.3033	44.61%	0.0%
W-09	5	0.76	0.6964	0.8236	0.6	1	0.03107	0.1673	22.02%	-11.76%

**Angular (Corrected) Transformed Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
W-08	5	0.9819	0.8555	1.108	0.4636	1.345	0.06167	0.3321	33.82%	0.0%
W-09	5	1.066	0.9936	1.139	0.8861	1.345	0.03549	0.1911	17.92%	-8.61%

**CETIS Analytical Report****Report Date:** 15 Dec-10 10:43 (p 2 of 4)**Test Code:** 01-7105-4561/AN WET Ref Comp**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

<b>Analysis ID:</b> 02-7121-2327	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.7.0
<b>Analyzed:</b> 15 Dec-10 10:43	<b>Analysis:</b> Parametric-All Pairwise	<b>Official Results:</b> Yes

**Survival Rate Detail**

<b>Sample Code</b>	<b>Rep 1</b>	<b>Rep 2</b>	<b>Rep 3</b>	<b>Rep 4</b>	<b>Rep 5</b>
W-08	0.8	0.2	0.6	0.8	1
W-09	0.8	0.8	0.6	0.6	1

**CETIS Analytical Report**

**Report Date:** 15 Dec-10 10:43 (p 3 of 4)  
**Test Code:** 01-7105-4561/AN WET Ref Comp

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

<b>Analysis ID:</b> 11-0164-6686	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.7.0						
<b>Analyzed:</b> 15 Dec-10 10:43	<b>Analysis:</b> Parametric-All Pairwise	<b>Official Results:</b> Yes						
<b>Batch ID:</b> 06-2679-7824	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b>						
<b>Start Date:</b> 25 Aug-10	<b>Protocol:</b> ASTM E1611-00 (2000)	<b>Diluent:</b>						
<b>Ending Date:</b> 22 Sep-10	<b>Species:</b> Neanthes arenaceodentata	<b>Brine:</b>						
<b>Duration:</b> 28d 0h	<b>Source:</b>	<b>Age:</b>						
Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project		
W-08	12-9420-1377	24 Aug-10	25 Aug-10	24h	Gulfco	Gulfco		
W-09	16-0157-7098	24 Aug-10	25 Aug-10	24h				
Sample Code	Material Type	Sample Source		Station Location	Latitude	Longitude		
W-08	Sediment	W-08		W-08				
W-09	Sediment	W-09		W-09				
Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	0	D<>0	Not Run					43.92%

**Student-Newman-Keuls Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
W-08		W-09	2.645	3.264	0.6964	0.0985	Non-Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision
Extreme Value	Grubbs Single Outlier	1.543	2.29	1.0000	No Outliers Detected

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.7963688	0.7963688	1	3.499	0.0983	Non-Significant Effect
Error	1.820923	0.2276154	8			
Total	2.617292	1.023984	9			

**ANOVA Assumptions**

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.584	23.15	0.6666	Equal Variances
Distribution	Shapiro-Wilk Normality	0.899		0.2138	Normal Distribution

**Mean Dry Biomass-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
W-08	5	1.586	1.426	1.745	0.912	1.93	0.07794	0.4197	26.47%	0.0%
W-09	5	2.15	1.949	2.351	1.456	2.75	0.0981	0.5283	24.57%	-35.6%

**CETIS Analytical Report**

Report Date: 15 Dec-10 10:43 (p 4 of 4)

Test Code: 01-7105-4561/AN WET Ref Comp

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

Analysis ID: 11-0164-6686

Endpoint: Mean Dry Biomass-mg

CETIS Version: CETISv1.7.0

Analyzed: 15 Dec-10 10:43

Analysis: Parametric-All Pairwise

Official Results: Yes

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
W-08	1.9	0.912	1.93	1.464	1.722
W-09	2.408	2.38	1.456	2.75	1.756

**CETIS Analytical Report**

**Report Date:** 15 Dec-10 10:42 (p 1 of 4)  
**Test Code:** 03-7729-6977/W-REF-NA

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

<b>Analysis ID:</b> 03-6947-6366	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.7.0
<b>Analyzed:</b> 15 Dec-10 10:41	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 06-2679-7824	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b>
<b>Start Date:</b> 25 Aug-10	<b>Protocol:</b> ASTM E1611-00 (2000)	<b>Diluent:</b>
<b>Ending Date:</b> 22 Sep-10	<b>Species:</b> Neanthes arenaceodentata	<b>Brine:</b>
<b>Duration:</b> 28d 0h	<b>Source:</b>	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Reference	02-3633-2190	24 Aug-10	24 Aug-09	24h	Gulfco	Gulfco
W-01	01-5466-3613	24 Aug-10	25 Aug-10	24h		
W-02	08-5451-7873	24 Aug-10	25 Aug-10	24h		
W-03	06-9110-7113	24 Aug-10	25 Aug-10	24h		
W-04	14-7060-6066	24 Aug-10	25 Aug-10	24h		
W-05	15-8235-8061	24 Aug-10	25 Aug-10	24h		
W-06	16-3918-5222	24 Aug-10	25 Aug-10	24h		
W-07	21-0527-6980	24 Aug-10	25 Aug-10	24h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Reference	Reference sediment	Wetland Reference			
W-01	Sediment	W-01	W-01		
W-02	Sediment	W-02	W-02		
W-03	Sediment	W-03	W-03		
W-04	Sediment	W-04	W-04		
W-05	Sediment	W-05	W-05		
W-06	Sediment	W-06	W-06		
W-07	Sediment	W-07	W-07		

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	0	C > T	Not Run					31.98%

**Equal Variance t Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
Reference		W-01	-2.233	1.771	0.217	0.9781	Non-Significant Effect
		W-02	-0.3367	1.771	0.2609	0.6291	Non-Significant Effect
		W-03	-0.977	1.771	0.2492	0.8268	Non-Significant Effect
		W-04	-1.066	1.771	0.217	0.8472	Non-Significant Effect
		W-05	0.01477	1.771	0.2364	0.4942	Non-Significant Effect
		W-06	-0.6549	1.771	0.243	0.7380	Non-Significant Effect
		W-07	-0.01402	1.771	0.2489	0.5055	Non-Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision
Extreme Value	Grubbs Single Outlier	2.688	3.085	0.2334	No Outliers Detected

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.3489899	0.0498557	7	0.9641	0.4712	Non-Significant Effect
Error	1.91336	0.05171242	37			
Total	2.26235	0.1015681	44			

**ANOVA Assumptions**

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Bartlett Equality of Variance	6.47	18.48	0.4861	Equal Variances
Distribution	Shapiro-Wilk Normality	0.9664		0.2133	Normal Distribution

**CETIS Analytical Report**

**Report Date:** 15 Dec-10 10:42 (p 2 of 4)  
**Test Code:** 03-7729-6977/W-REF-NA

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

**Analysis ID:** 03-6947-6366    **Endpoint:** Survival Rate  
**Analyzed:** 15 Dec-10 10:41    **Analysis:** Parametric-Two Sample

**CETIS Version:** CETISv1.7.0  
**Official Results:** Yes

**Survival Rate Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
Reference	10	0.72	0.6307	0.8093	0.2	1	0.04359	0.2348	32.61%	0.0%
W-01	5	0.96	0.926	0.994	0.8	1	0.01661	0.08944	9.32%	-33.33%
W-02	5	0.76	0.6608	0.8592	0.4	1	0.04842	0.2608	34.31%	-5.56%
W-03	5	0.84	0.7567	0.9233	0.6	1	0.04068	0.2191	26.08%	-16.67%
W-04	5	0.84	0.806	0.874	0.8	1	0.01661	0.08944	10.65%	-16.67%
W-05	5	0.72	0.652	0.788	0.6	1	0.03322	0.1789	24.85%	0.0%
W-06	5	0.8	0.7239	0.8761	0.6	1	0.03714	0.2	25.0%	-11.11%
W-07	5	0.72	0.6333	0.8067	0.4	1	0.04235	0.228	31.67%	0.0%

**Angular (Corrected) Transformed Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
Reference	10	1.024	0.9255	1.123	0.4636	1.345	0.04815	0.2593	25.32%	0.0%
W-01	5	1.298	1.257	1.338	1.107	1.345	0.01978	0.1065	8.21%	-26.71%
W-02	5	1.074	0.9636	1.184	0.6847	1.345	0.05375	0.2895	26.96%	-4.84%
W-03	5	1.162	1.066	1.257	0.8861	1.345	0.04671	0.2515	21.65%	-13.43%
W-04	5	1.155	1.114	1.195	1.107	1.345	0.01978	0.1065	9.22%	-12.76%
W-05	5	1.022	0.9444	1.1	0.8861	1.345	0.03796	0.2044	20.0%	0.19%
W-06	5	1.114	1.027	1.201	0.8861	1.345	0.04264	0.2296	20.61%	-8.78%
W-07	5	1.026	0.9308	1.121	0.6847	1.345	0.04653	0.2506	24.42%	-0.19%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Reference	0.8	0.2	0.6	0.8	1	0.8	0.8	0.6	0.6	1
W-01	1	1	1	0.8	1					
W-02	1	1	0.6	0.4	0.8					
W-03	1	0.6	1	1	0.6					
W-04	0.8	0.8	0.8	0.8	1					
W-05	0.6	0.6	1	0.8	0.6					
W-06	1	0.6	0.8	0.6	1					
W-07	0.6	0.8	0.4	0.8	1					

**CETIS Analytical Report**

**Report Date:** 15 Dec-10 10:42 (p 3 of 4)  
**Test Code:** 03-7729-6977/W-REF-NA

Neanthes Survival and Growth Test						MACTEC Biology-Toxicology LAB				
<b>Analysis ID:</b> 12-5072-0846	<b>Endpoint:</b> Mean Dry Biomass-mg					<b>CETIS Version:</b> CETISv1.7.0				
<b>Analyzed:</b> 15 Dec-10 10:41	<b>Analysis:</b> Parametric-Two Sample					<b>Official Results:</b> Yes				
<b>Batch ID:</b> 06-2679-7824	<b>Test Type:</b> Survival-Growth					<b>Analyst:</b>				
<b>Start Date:</b> 25 Aug-10	<b>Protocol:</b> ASTM E1611-00 (2000)					<b>Diluent:</b>				
<b>Ending Date:</b> 22 Sep-10	<b>Species:</b> Neanthes arenaceodentata					<b>Brine:</b>				
<b>Duration:</b> 28d 0h	<b>Source:</b>					<b>Age:</b>				
Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project				
Reference	02-3633-2190	24 Aug-10	24 Aug-09	24h	Gulfco	Gulfco				
W-01	01-5466-3613	24 Aug-10	25 Aug-10	24h						
W-02	08-5451-7873	24 Aug-10	25 Aug-10	24h						
W-03	06-9110-7113	24 Aug-10	25 Aug-10	24h						
W-04	14-7060-6066	24 Aug-10	25 Aug-10	24h						
W-05	15-8235-8061	24 Aug-10	25 Aug-10	24h						
W-06	16-3918-5222	24 Aug-10	25 Aug-10	24h						
W-07	21-0527-6980	24 Aug-10	25 Aug-10	24h						
Sample Code	Material Type	Sample Source			Station Location	Latitude	Longitude			
Reference	Reference sediment	Wetland Reference								
W-01	Sediment	W-01			W-01					
W-02	Sediment	W-02			W-02					
W-03	Sediment	W-03			W-03					
W-04	Sediment	W-04			W-04					
W-05	Sediment	W-05			W-05					
W-06	Sediment	W-06			W-06					
W-07	Sediment	W-07			W-07					
Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD		
Untransformed	0	C > T	Not Run					36.07%		
Equal Variance t Two-Sample Test										
Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)			
Reference		W-01	-4.244	1.771	0.503	0.9995	Non-Significant Effect			
		W-02	-1.208	1.771	0.6115	0.8757	Non-Significant Effect			
		W-03	-0.4514	1.771	0.5327	0.6704	Non-Significant Effect			
		W-04	-1.996	1.771	0.5875	0.9664	Non-Significant Effect			
		W-05	-1.122	1.771	0.5995	0.8589	Non-Significant Effect			
		W-06	0.2789	1.771	0.5575	0.3924	Non-Significant Effect			
		W-07	-1.534	1.771	0.6736	0.9255	Non-Significant Effect			
Auxiliary Tests										
Attribute	Test		Test Stat	Critical	P-Value	Decision				
Extreme Value	Grubbs Single Outlier		2.012	3.085	1.0000	No Outliers Detected				
ANOVA Table										
Source	Sum Squares		Mean Square		DF	F Stat	P-Value	Decision(5%)		
Between	6.846094		0.9780134		7	2.106	0.0672	Non-Significant Effect		
Error	17.17902		0.4642978		37					
Total	24.02511		1.442311		44					
ANOVA Assumptions										
Attribute	Test		Test Stat	Critical	P-Value	Decision(1%)				
Variances	Bartlett Equality of Variance		3.244	18.48	0.8616	Equal Variances				
Distribution	Shapiro-Wilk Normality		0.9785		0.5596	Normal Distribution				

**CETIS Analytical Report**

**Report Date:** 15 Dec-10 10:42 (p 4 of 4)  
**Test Code:** 03-7729-6977/W-REF-NA

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

**Analysis ID:** 12-5072-0846    **Endpoint:** Mean Dry Biomass-mg  
**Analyzed:** 15 Dec-10 10:41    **Analysis:** Parametric-Two Sample

**CETIS Version:** CETISv1.7.0  
**Official Results:** Yes

**Mean Dry Biomass-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
Reference	10	1.868	1.663	2.073	0.912	2.75	0.1001	0.5393	28.87%	0.0%
W-01	5	3.073	2.895	3.251	2.446	3.564	0.08703	0.4687	15.25%	-64.54%
W-02	5	2.285	1.981	2.588	1.402	3.498	0.1482	0.7982	34.94%	-22.33%
W-03	5	2.004	1.786	2.221	1.552	2.94	0.106	0.571	28.5%	-7.27%
W-04	5	2.53	2.251	2.809	1.828	3.494	0.1362	0.7334	28.99%	-35.45%
W-05	5	2.248	1.956	2.539	1.19	3.1	0.1423	0.7664	34.1%	-20.33%
W-06	5	1.78	1.534	2.026	0.852	2.622	0.1202	0.6475	36.38%	4.7%
W-07	5	2.451	2.088	2.815	1.194	3.638	0.1774	0.9556	38.98%	-31.23%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Reference	1.9	0.912	1.93	1.464	1.722	2.408	2.38	1.456	2.75	1.756
W-01	2.736	3.564	3.406	3.214	2.446					
W-02	2.274	3.498	1.774	2.476	1.402					
W-03	2.94	1.552	2.118	1.828	1.58					
W-04	1.984	3.114	2.23	1.828	3.494					
W-05	3.1	2.808	2.322	1.818	1.19					
W-06	2.622	1.636	1.722	2.068	0.852					
W-07	2.28	3.122	1.194	2.022	3.638					

**CETIS Analytical Report**

**Report Date:** 15 Dec-10 12:19 (p 1 of 4)  
**Test Code:** 10-9510-7460/NAS REF Compari

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

<b>Analysis ID:</b> 10-9764-2317	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.7.0
<b>Analyzed:</b> 09 Dec-10 15:36	<b>Analysis:</b> Parametric-All Pairwise	<b>Official Results:</b> Yes

<b>Batch ID:</b> 19-2467-8032	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b>
<b>Start Date:</b> 10 Sep-10 00:01	<b>Protocol:</b>	<b>Diluent:</b>
<b>Ending Date:</b> 01 Oct-10 00:01	<b>Species:</b> Neanthes arenaceodentata	<b>Brine:</b>
<b>Duration:</b> 21d 0h	<b>Source:</b>	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
NAS07	13-2306-7028	10 Sep-10	01 Oct-10	1m		
NAS08	19-3755-2485	10 Sep-10	10 Sep-10	1m		
NAS09	16-4746-9613	10 Sep-10	10 Sep-10	1m		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
NAS07	Sediment	NAS07			
NAS08	Sediment	NAS08			
NAS09	Sediment	NAS09			

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	0	D<>0	Not Run					22.36%

**Student-Newman-Keuls Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
NAS07	NAS08		4.004	3.084	0.2432	0.0153	Significant Effect
	NAS09		4.514	3.775	0.2977	0.0198	Significant Effect
NAS08	NAS09		0.5106	3.084	0.2432	0.7245	Non-Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision
Extreme Value	Grubbs Single Outlier	1.528	2.548	1.0000	No Outliers Detected

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.3802196	0.1901098	2	6.112	0.0148	Significant Effect
Error	0.3732687	0.03110573	12			
Total	0.7534883	0.2212155	14			

**ANOVA Assumptions**

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Bartlett Equality of Variance	0.8075	9.21	0.6678	Equal Variances
Distribution	Shapiro-Wilk Normality	0.9127		0.1490	Normal Distribution

**Survival Rate Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
NAS07	5	0.92	0.8783	0.9617	0.8	1	0.02034	0.1095	11.91%	0.0%
NAS08	5	0.64	0.5764	0.7036	0.4	0.8	0.03107	0.1673	26.15%	30.43%
NAS09	5	0.6	0.5239	0.6761	0.4	0.8	0.03714	0.2	33.33%	34.78%

**CETIS Analytical Report**

**Report Date:** 15 Dec-10 12:19 (p 2 of 4)  
**Test Code:** 10-9510-7460/NAS REF Compa

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

**Analysis ID:** 10-9764-2317      **Endpoint:** Survival Rate  
**Analyzed:** 09 Dec-10 15:36      **Analysis:** Parametric-All Pairwise

**CETIS Version:** CETISv1.7.0  
**Official Results:** Yes

**Survival Rate Detail****Sample Code**

NAS07  
NAS08  
NAS09

**CETIS Analytical Report**

Report Date: 15 Dec-10 12:19 (p 3 of 4)

Test Code: 10-9510-7460/NAS REF Compa

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

<b>Analysis ID:</b> 11-2045-0920	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.7.0
<b>Analyzed:</b> 09 Dec-10 15:36	<b>Analysis:</b> Parametric-All Pairwise	<b>Official Results:</b> Yes

<b>Batch ID:</b> 19-2467-8032	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b>
<b>Start Date:</b> 10 Sep-10 00:01	<b>Protocol:</b>	<b>Diluent:</b>
<b>Ending Date:</b> 01 Oct-10 00:01	<b>Species:</b> Neanthes arenaceodentata	<b>Brine:</b>
<b>Duration:</b> 21d 0h	<b>Source:</b>	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
NAS07	13-2306-7028	10 Sep-10	01 Oct-10	1m		
NAS08	19-3755-2485	10 Sep-10	10 Sep-10	1m		
NAS09	16-4746-9613	10 Sep-10	10 Sep-10	1m		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
NAS07	Sediment	NAS07			
NAS08	Sediment	NAS08			
NAS09	Sediment	NAS09			

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	0	D<>0	Not Run					26.32%

**Student-Newman-Keuls Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
NAS07	NAS08		6.458	3.084	0.4034	0.0008	Significant Effect
	NAS09		7.503	3.775	0.4938	0.0007	Significant Effect
NAS08	NAS09		1.046	3.084	0.4034	0.4741	Non-Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision
Extreme Value	Grubbs Single Outlier	2.137	2.548	0.3042	No Outliers Detected

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	2.826567	1.413283	2	16.52	0.0004	Significant Effect
Error	1.026897	0.08557478	12			
Total	3.853464	1.498858	14			

**ANOVA Assumptions**

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Bartlett Equality of Variance	1.502	9.21	0.4719	Equal Variances
Distribution	Shapiro-Wilk Normality	0.9588		0.6723	Normal Distribution

**Mean Dry Biomass-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
NAS07	5	1.533	1.385	1.681	0.954	1.96	0.07235	0.3896	25.42%	0.0%
NAS08	5	0.688	0.6058	0.7702	0.384	0.918	0.04014	0.2162	31.42%	55.11%
NAS09	5	0.5512	0.4594	0.643	0.18	0.828	0.0448	0.2413	43.77%	64.04%

**CETIS Analytical Report**

Report Date: 15 Dec-10 12:19 (p 4 of 4)  
Test Code: 10-9510-7460/NAS REF Compari

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

Analysis ID: 11-2045-0920      Endpoint: Mean Dry Biomass-mg  
Analyzed: 09 Dec-10 15:36      Analysis: Parametric-All Pairwise

CETIS Version: CETISv1.7.0  
Official Results: Yes

**Mean Dry Biomass-mg Detail****Sample Code**

NAS07  
NAS08  
NAS09

**CETIS Analytical Report**

**Report Date:** 15 Dec-10 12:20 (p 1 of 4)  
**Test Code:** 04-5244-6949/REF NAS07 Comp

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

<b>Analysis ID:</b> 12-3541-2939	<b>Endpoint:</b> Survival Rate	<b>CETIS Version:</b> CETISv1.7.0
<b>Analyzed:</b> 13 Dec-10 15:38	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-9021-9355	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b>
<b>Start Date:</b> 10 Sep-10	<b>Protocol:</b>	<b>Diluent:</b>
<b>Ending Date:</b> 01 Oct-10	<b>Species:</b> Neanthes arenaceodentata	<b>Brine:</b>
<b>Duration:</b> 21d 0h	<b>Source:</b>	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
NAS07 (REF)	03-3464-7421	10 Sep-10	10 Sep-10	N/A		
NAS01	11-1046-0661	10 Sep-10	10 Sep-10	N/A		
NAS02	04-1287-5100	10 Sep-10	10 Sep-10	N/A		
NAS03	10-0178-8311	10 Sep-10	10 Sep-10	N/A		
NAS04	17-1619-6284	10 Sep-10	10 Sep-10	N/A		
NAS05	06-1191-8123	10 Sep-10	10 Sep-10	N/A		
NAS06	07-7972-3735	10 Sep-10	10 Sep-10	N/A		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
NAS07 (REF)	Reference sediment	NAS REF (NAS 07)			
NAS01	Sediment	NAS01			
NAS02	Sediment	NAS02			
NAS03	Sediment	NAS03			
NAS04	Sediment	NAS04			
NAS05	Sediment	NAS05			
NAS06	Sediment	NAS06			

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	0	C > T	Not Run					13.97%

**Equal Variance t Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
NAS07 (REF)		NAS01	1.242	1.86	0.264	0.1247	Non-Significant Effect
		NAS02	0.5774	1.86	0.1534	0.2898	Non-Significant Effect
		NAS03	-0.6325	1.86	0.14	0.7276	Non-Significant Effect
		NAS04	0.8811	1.86	0.1938	0.2020	Non-Significant Effect
		NAS05	1.242	1.86	0.264	0.1247	Non-Significant Effect
		NAS06	0.5774	1.86	0.1534	0.2898	Non-Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision
Extreme Value	Grubbs Single Outlier	2.194	2.978	0.8281	No Outliers Detected

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.2141224	0.03568706	6	0.9347	0.4859	Non-Significant Effect
Error	1.069062	0.03818078	28			
Total	1.283184	0.07386784	34			

**ANOVA Assumptions**

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Bartlett Equality of Variance	7.633	16.81	0.2662	Equal Variances
Distribution	Shapiro-Wilk Normality	0.9573		0.1893	Normal Distribution

**CETIS Analytical Report**

Report Date: 15 Dec-10 12:20 (p 2 of 4)

Test Code: 04-5244-6949/REF NAS07 Comp

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

**Analysis ID:** 12-3541-2939    **Endpoint:** Survival Rate  
**Analyzed:** 13 Dec-10 15:38    **Analysis:** Parametric-Two Sample    **CETIS Version:** CETISv1.7.0  
**Official Results:** Yes

**Survival Rate Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
NAS07 (REF)	5	0.92	0.8783	0.9617	0.8	1	0.02034	0.1095	11.91%	0.0%
NAS01	5	0.76	0.6608	0.8592	0.4	1	0.04842	0.2608	34.31%	17.39%
NAS02	5	0.88	0.8383	0.9217	0.8	1	0.02034	0.1095	12.45%	4.35%
NAS03	5	0.96	0.926	0.994	0.8	1	0.01661	0.08944	9.32%	-4.35%
NAS04	5	0.84	0.7764	0.9036	0.6	1	0.03107	0.1673	19.92%	8.7%
NAS05	5	0.76	0.6608	0.8592	0.4	1	0.04842	0.2608	34.31%	17.39%
NAS06	5	0.88	0.8383	0.9217	0.8	1	0.02034	0.1095	12.45%	4.35%

**Angular (Corrected) Transformed Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
NAS07 (REF)	5	1.25	1.2	1.3	1.107	1.345	0.02422	0.1304	10.43%	0.0%
NAS01	5	1.074	0.9636	1.184	0.6847	1.345	0.05375	0.2895	26.96%	14.11%
NAS02	5	1.202	1.153	1.252	1.107	1.345	0.02422	0.1304	10.85%	3.81%
NAS03	5	1.298	1.257	1.338	1.107	1.345	0.01978	0.1065	8.21%	-3.81%
NAS04	5	1.158	1.085	1.232	0.8861	1.345	0.03587	0.1932	16.68%	7.35%
NAS05	5	1.074	0.9636	1.184	0.6847	1.345	0.05375	0.2895	26.96%	14.11%
NAS06	5	1.202	1.153	1.252	1.107	1.345	0.02422	0.1304	10.85%	3.81%

**Survival Rate Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
NAS07 (REF)	1	1	0.8	1	0.8
NAS01	0.6	1	0.4	0.8	1
NAS02	1	0.8	1	0.8	0.8
NAS03	1	0.8	1	1	1
NAS04	0.6	1	0.8	1	0.8
NAS05	0.8	1	0.4	0.6	1
NAS06	0.8	1	1	0.8	0.8

**CETIS Analytical Report**

Report Date: 15 Dec-10 12:20 (p 3 of 4)

Test Code: 04-5244-6949/REF NAS07 Comp

**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB**

<b>Analysis ID:</b> 11-1638-2075	<b>Endpoint:</b> Mean Dry Biomass-mg	<b>CETIS Version:</b> CETISv1.7.0
<b>Analyzed:</b> 13 Dec-10 15:37	<b>Analysis:</b> Parametric-Two Sample	<b>Official Results:</b> Yes
<b>Batch ID:</b> 11-9021-9355	<b>Test Type:</b> Survival-Growth	<b>Analyst:</b>
<b>Start Date:</b> 10 Sep-10	<b>Protocol:</b>	<b>Diluent:</b>
<b>Ending Date:</b> 01 Oct-10	<b>Species:</b> Neanthes arenaceodentata	<b>Brine:</b>
<b>Duration:</b> 21d 0h	<b>Source:</b>	<b>Age:</b>

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
NAS07 (REF)	03-3464-7421	10 Sep-10	10 Sep-10	N/A		
NAS01	11-1046-0661	10 Sep-10	10 Sep-10	N/A		
NAS02	04-1287-5100	10 Sep-10	10 Sep-10	N/A		
NAS03	10-0178-8311	10 Sep-10	10 Sep-10	N/A		
NAS04	17-1619-6284	10 Sep-10	10 Sep-10	N/A		
NAS05	06-1191-8123	10 Sep-10	10 Sep-10	N/A		
NAS06	07-7972-3735	10 Sep-10	10 Sep-10	N/A		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
NAS07 (REF)	Reference sediment	NAS REF (NAS 07)			
NAS01	Sediment	NAS01			
NAS02	Sediment	NAS02			
NAS03	Sediment	NAS03			
NAS04	Sediment	NAS04			
NAS05	Sediment	NAS05			
NAS06	Sediment	NAS06			

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	0	C > T	Not Run					35.8%

**Equal Variance t Two-Sample Test**

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
NAS07 (REF)		NAS01	4.464	1.86	0.3616	0.0011	Significant Effect
		NAS02	-2.247	1.86	0.4882	0.9726	Non-Significant Effect
		NAS03	-3.286	1.86	0.6057	0.9945	Non-Significant Effect
		NAS04	-7.757	1.86	0.7161	1.0000	Non-Significant Effect
		NAS05	-0.8989	1.86	0.9623	0.8025	Non-Significant Effect
		NAS06	-0.389	1.86	0.5488	0.6463	Non-Significant Effect

**Auxiliary Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision
Extreme Value	Grubbs Single Outlier	2.992	2.978	0.0470	Outlier Detected

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	43.42538	7.237564	6	17.96	<0.0001	Significant Effect
Error	11.28514	0.4030408	28			
Total	54.71052	7.640604	34			

**ANOVA Assumptions**

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Bartlett Equality of Variance	11.13	16.81	0.0845	Equal Variances
Distribution	Shapiro-Wilk Normality	0.9634		0.2878	Normal Distribution

**CETIS Analytical Report**Report Date: 15 Dec-10 12:20 (p 4 of 4)  
Test Code: 04-5244-6949/REF NAS07 Comp**Neanthes Survival and Growth Test****MACTEC Biology-Toxicology LAB****Analysis ID:** 11-1638-2075    **Endpoint:** Mean Dry Biomass-mg  
**Analyzed:** 13 Dec-10 15:37    **Analysis:** Parametric-Two Sample    **CETIS Version:** CETISv1.7.0  
**Official Results:** Yes**Mean Dry Biomass-mg Summary**

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
NAS07 (REF)	5	1.533	1.385	1.681	0.954	1.96	0.07235	0.3896	25.42%	0.0%
NAS01	5	0.6648	0.5914	0.7382	0.484	0.962	0.03585	0.1931	29.04%	56.63%
NAS02	5	2.123	1.956	2.29	1.552	2.656	0.08153	0.4391	20.68%	-38.49%
NAS03	5	2.603	2.369	2.837	1.918	3.358	0.1143	0.6154	23.64%	-69.83%
NAS04	5	4.52	4.228	4.812	3.43	5.484	0.1426	0.7679	16.99%	-194.9%
NAS05	5	1.998	1.584	2.412	0.91	3.722	0.2023	1.09	54.54%	-30.35%
NAS06	5	1.648	1.445	1.85	1.016	2.478	0.09891	0.5327	32.33%	-7.49%

**Mean Dry Biomass-mg Detail**

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
NAS07 (REF)	1.712	1.688	1.96	1.35	0.954
NAS01	0.962	0.58	0.548	0.484	0.75
NAS02	2.656	1.81	2.268	2.328	1.552
NAS03	1.918	2.022	3.358	2.918	2.8
NAS04	3.43	4.78	4.166	5.484	4.74
NAS05	3.722	2.248	1.292	0.91	1.818
NAS06	1.016	1.7	1.6	1.444	2.478